



STIC Search Report

EIC 1700

STIC Database Tracking Number: 161804

TO: Raymond Alejandro
Location: Rem 6B59
Art Unit : 1745
August 18, 2005

Case Serial Number: 09/891200

From: Les Henderson
Location: EIC 1700
REM 4B28 / 4A30
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Search Notes

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(FILE 'HOME' ENTERED AT 08:26:50 ON 17 AUG 2005)

FILE 'HCAPLUS' ENTERED AT 08:27:35 ON 17 AUG 2005

E US20020031695/PN

L1 1 SEA ABB=ON PLU=ON US20020031695/PN
D ALL
SEL L1 RN

FILE 'REGISTRY' ENTERED AT 08:31:04 ON 17 AUG 2005

L2 14 SEA ABB=ON PLU=ON (12023-04-0/BI OR 12196-72-4/BI OR
1333-74-0/BI OR 153328-13-3/BI OR 18649-05-3/BI OR
191980-68-4/BI OR 251566-28-6/BI OR 395656-87-8/BI OR
395656-88-9/BI OR 67-56-1/BI OR 7440-02-0/BI OR 7440-05-3
/BI OR 7440-32-6/BI OR 7440-62-2/BI)
D SCAN

E 1333-74-0/RN

L3 1 SEA ABB=ON PLU=ON 1333-74-0/RN
D SCAN

E 67-56-1/RN

L4 1 SEA ABB=ON PLU=ON 67-56-1/RN
D SCAN

E 7440-05-3/RN

L5 1 SEA ABB=ON PLU=ON 7440-05-3/RN
D SCAN

E 7440-32-6/RN

L6 1 SEA ABB=ON PLU=ON 7440-32-6/RN
D SCAN

E SILVER/CN

L7 1 SEA ABB=ON PLU=ON SILVER/CN
D RN

E 7440-22-4/RN

L8 1 SEA ABB=ON PLU=ON 7440-22-4/RN
D SCAN

E COPPER/CN

L9 1 SEA ABB=ON PLU=ON COPPER/CN
D RN

E 7440-50-8/RN

L*** DEL 1 S 7440-50-8/RN
D SCAN

E 7440-62-2/RN

L11 1 SEA ABB=ON PLU=ON 7440-62-2/RN
D SCAN

E LANTHANUM/CN

L12 1 SEA ABB=ON PLU=ON LANTHANUM/CN
D SCAN

D RN

E 7439-91-0/RN

L13 1 SEA ABB=ON PLU=ON 7439-91-0/RN
D SCAN

E 7440-02-0/RN

L14 1 SEA ABB=ON PLU=ON 7440-02-0/RN
D SCAN

E IRON/CN

L15 1 SEA ABB=ON PLU=ON IRON/CN
D RN

E 7439-89-6/RN

L16 1 SEA ABB=ON PLU=ON 7439-89-6/RN
D SCAN

E CHROMIUM/CN

L17 1 SEA ABB=ON PLU=ON CHROMIUM/CN
D RN

E 7440-47-3/RN

L18 1 SEA ABB=ON PLU=ON 7440-47-3/RN
D SCAN

L19 D SCAN L2
 E 12023-04-0/RN
 1 SEA ABB=ON PLU=ON 12023-04-0/RN
 D SCAN
 E AGPD/MF
 L20 1 SEA ABB=ON PLU=ON AGPD/MF
 D SCAN
 D RN
 E 60495-83-2/RN
 1 SEA ABB=ON PLU=ON 60495-83-2/RN
 L21 366 SEA ABB=ON PLU=ON (AG(L) PD)/ELS(L) 2/ELC.SUB
 E CUPD/MF
 L23 2 SEA ABB=ON PLU=ON CUPD/MF
 D SCAN
 D 1-2 RN
 L24 1 SEA ABB=ON PLU=ON 849794-14-5/RN
 D SCAN
 L25 1 SEA ABB=ON PLU=ON 12381-74-7/RN
 D SCAN
 L26 265 SEA ABB=ON PLU=ON (CU(L) PD)/ELS(L) 2/ELC.SUB
 E LANI5/MF
 L27 1 SEA ABB=ON PLU=ON LANI5/MF
 D SCAN
 E CRV2/MF
 E CRV/MF
 L28 4 SEA ABB=ON PLU=ON CRV/MF
 D SCAN
 E CRV2/MF
 E V2CR/MF
 L29 28 SEA ABB=ON PLU=ON 34 CR/MAC AND 66 V/MAC
 L30 10 SEA ABB=ON PLU=ON L29 AND 2/NC
 L31 149 SEA ABB=ON PLU=ON (CR(L)V)/ELS(L) 2/ELC.SUB
 L32 209 SEA ABB=ON PLU=ON (NI(L)TI(L)V)/ELS(L) 3/ELC.SUB
 L33 213 SEA ABB=ON PLU=ON (NI(L)V)/ELS(L) 2/ELC.SUB
 L34 310 SEA ABB=ON PLU=ON (TI(L)V)/ELS(L) 2/ELC.SUB
 L35 6 SEA ABB=ON PLU=ON (BA(L)CA(L)H(L)NB(L)O)/ELS(L) 5/ELC.SU
 B
 D SCAN
 L36 5 SEA ABB=ON PLU=ON L35 AND H2O
 L37 1 SEA ABB=ON PLU=ON L35 NOT L36
 D SCAN
 L38 43 SEA ABB=ON PLU=ON (BA(L)CA(L)NB(L)O)/ELS(L) 4/ELC.SUB
 L39 42 SEA ABB=ON PLU=ON (CS(L)H(L)S(L)O)/ELS(L) 4/ELC.SUB
 L40 13 SEA ABB=ON PLU=ON L39 AND H2O
 L41 3 SEA ABB=ON PLU=ON (CS(L)S(L)O)/ELS(L) 3/ELC.SUB
 D SCAN
 D SCAN L40
 L42 6 SEA ABB=ON PLU=ON L39 AND SO4
 D SCAN
 E CS5H3(SO4) 4
 E CS5H3(SO4) 4/MF
 E CS5H4O16.5S16/MF
 E SNCL2/MF
 E CL2SN/MF
 L43 10 SEA ABB=ON PLU=ON CL2SN/MF
 D SCAN
 L44 91 SEA ABB=ON PLU=ON (SN(L)CL(L)H(L)O)/ELS(L) 4/ELC.SUB
 E TIN CHLORIDE HYDRATE/CN
 L45 38 SEA ABB=ON PLU=ON L44 AND H2O
 L46 14 SEA ABB=ON PLU=ON (AG(L)I(L)W(L)O)/ELS(L) 4/ELC.SUB
 E H2KO4P/MF
 L47 33 SEA ABB=ON PLU=ON H2KO4P/MF
 E TETRAAMMONIUM DIHYDROGEN TRISELENATE/CN
 L48 52 SEA ABB=ON PLU=ON (N(L)H(L)SE(L)O)/ELS(L) 4/ELC.SUB
 E CSDO4S/MF
 L49 8 SEA ABB=ON PLU=ON (CS(L)D(L)S(L)O)/ELS(L) 4/ELC.SUB

D SCAN
L50 55 SEA ABB=ON PLU=ON (CS(L)H(L)P(L)O)/ELS(L)4/ELC.SUB
L51 2 SEA ABB=ON PLU=ON L49 AND SO4
D SCAN
L52 1 SEA ABB=ON PLU=ON L50 AND PO4
D SCAN
L53 23 SEA ABB=ON PLU=ON (SR(L)ZR(L)Y(L)O)/ELS(L)4/ELC.SUB
L54 15 SEA ABB=ON PLU=ON (SI(L)N(L)H(L)O(L)P)/ELS(L)5/ELC.SUB

D SCAN
L55 33454 SEA ABB=ON PLU=ON (SI(L)O(L)P)/ELS
L56 60 SEA ABB=ON PLU=ON L55 AND AMMONIUM
L57 13 SEA ABB=ON PLU=ON L56 AND PHOSPHATE
D SCAN
L58 5 SEA ABB=ON PLU=ON L57 AND (SILICON OR SILICA OR
SILICATE)
D SCAN
E SILICA/CRN
E SILICA/RN
E SILICA/CN
L59 1 SEA ABB=ON PLU=ON SILICA/CN
D RN
L60 2201 SEA ABB=ON PLU=ON 7631-86-9/CRN
E POLYPHOSPHATE/CN
E PHOSPHATE/CN
L61 1 SEA ABB=ON PLU=ON PHOSPHATE/CN
D SCAN
D RN
L62 14061 SEA ABB=ON PLU=ON 14265-44-2/CRN
E AMMONIUM/CN
L63 1 SEA ABB=ON PLU=ON AMMONIUM/CN
D SCAN
D RN
L64 2837 SEA ABB=ON PLU=ON 14798-03-9/CRN
L65 0 SEA ABB=ON PLU=ON L60 AND L62 AND L64
L66 2 SEA ABB=ON PLU=ON (LA(L)SR(L)SC(L)O(L)MG)/ELS(L)5/ELC.S
UB
D SCAN
L67 64 SEA ABB=ON PLU=ON (BA(L)CE(L)ZR(L)O(L)(GD OR ND))/ELS(L
)5/ELC.SUB
E ZIRCONIUM PHOSPHATE PYROPHOSPHATE/CN
L68 26 SEA ABB=ON PLU=ON (ZR(L)P(L)O)/ELS(L)3/ELC.SUB
L69 1 SEA ABB=ON PLU=ON L68 AND PYROPHOSPHATE
D SCAN
L70 0 SEA ABB=ON PLU=ON L68 AND MESOPOROUS
L71 1 SEA ABB=ON PLU=ON L68 AND P207
D SCAN
L72 1 SEA ABB=ON PLU=ON L69 OR L71

FILE 'HCAPLUS' ENTERED AT 11:10:18 ON 17 AUG 2005

E FUEL CELLS/CT
E E3+ALL
L73 89636 SEA ABB=ON PLU=ON FUELCELL? OR FUEL?(2A)CELL? OR FC OR
SOFC OR DFC OR PEMFC
E ELECTROLYTE/CT
E E3+ALL
E ELECTROLYTES/CT
E E3+ALL
L74 3685 SEA ABB=ON PLU=ON ("FUEL CELL ELECTROLYTES"/CT OR
"FUEL-CELL ELECTROLYTES"/CT)
L75 3535795 SEA ABB=ON PLU=ON ELECTROLYT? OR ELECTRO(A)LYT? OR
SALT? OR ION? OR CATION? OR ANION? OR COUNTERION? OR
COUNTER(A) ION?
L76 25758 SEA ABB=ON PLU=ON L73(L)L75
L77 25758 SEA ABB=ON PLU=ON L74 OR L76
E SUPPORT/CT

E E3+ALL
 E SUPPORTS/CT
 E E3+ALL
 L78 10663 SEA ABB=ON PLU=ON METAL? (A) SUPPORT?
 L79 22 SEA ABB=ON PLU=ON (METAL? (A) HYDRID?) (2A) SUPPORT?
 L80 28 SEA ABB=ON PLU=ON (METAL? (A) HYDRID?) (3A) SUPPORT?
 L81 1 SEA ABB=ON PLU=ON L80 AND L77
 D SCAN
 L82 78 SEA ABB=ON PLU=ON L78 AND L77
 L83 10591 SEA ABB=ON PLU=ON METAL? (A) HYDRID?
 L84 91 SEA ABB=ON PLU=ON L83 AND L77
 L85 7974 SEA ABB=ON PLU=ON (ELECTRON# OR HOLE# OR CHARGE#) (2A) IN
 SULAT?
 E PROTON/CT
 E PROTONS/CT
 L86 49586 SEA ABB=ON PLU=ON (PROTON? OR HYDROGEN? OR H) (A) (CONDUC
 T? OR TRANSFER? OR FLUX?)
 L87 QUE ABB=ON PLU=ON FILM? OR THINFILM? OR LAYER? OR
 OVERLAY? OR OVERLAIID? OR SHEET? OR COAT? OR TOPCOAT? OR
 OVERCOAT? OR SHEATH? OR COVER? OR ENVELOP? OR ENCASE? OR
 ENWRAP? OR OVERSPREAD?
 L88 0 SEA ABB=ON PLU=ON (L85 (3A) L86) (4A) L87
 L89 2 SEA ABB=ON PLU=ON L85 (3A) L86
 D SCAN
 L90 1 SEA ABB=ON PLU=ON (L85 (L) L86) (L) L87
 D SCAN
 L91 1 SEA ABB=ON PLU=ON L85 AND L86 AND L87
 D SCAN
 L92 79 SEA ABB=ON PLU=ON (L82 OR L80) AND L77
 L93 168 SEA ABB=ON PLU=ON L92 OR L84
 L94 2735 SEA ABB=ON PLU=ON L85 (3A) L87
 L95 832 SEA ABB=ON PLU=ON L86 (3A) L87
 L96 0 SEA ABB=ON PLU=ON L93 AND L94
 L97 2 SEA ABB=ON PLU=ON L93 AND L95
 D SCAN
 L98 0 SEA ABB=ON PLU=ON L94 AND L95
 D QUE L75
 D QUE L93
 L99 67 SEA ABB=ON PLU=ON L93 AND L87
 L100 170 SEA ABB=ON PLU=ON AREA (2A) SPECIF? (2A) RESISTAN?
 L101 0 SEA ABB=ON PLU=ON L99 AND L100
 L102 0 SEA ABB=ON PLU=ON L100 AND L93
 L103 40 SEA ABB=ON PLU=ON L100 AND L77
 D L103 1-10 KWIC
 L104 6827 SEA ABB=ON PLU=ON OHM? (A) CM?
 L105 43 SEA ABB=ON PLU=ON L104 AND L77
 L106 0 SEA ABB=ON PLU=ON L104 AND L99
 L107 0 SEA ABB=ON PLU=ON L104 AND L93
 L108 83 SEA ABB=ON PLU=ON L103 OR L105
 L109 0 SEA ABB=ON PLU=ON L108 AND L83
 L110 0 SEA ABB=ON PLU=ON L108 AND L80
 D QUE
 L111 0 SEA ABB=ON PLU=ON L108 AND L78
 L112 16 SEA ABB=ON PLU=ON L108 AND SUPPORT?
 L113 33 SEA ABB=ON PLU=ON L108 AND L87
 L114 9 SEA ABB=ON PLU=ON L112 AND L87
 D SCAN
 L115 0 SEA ABB=ON PLU=ON L112 AND (L85 OR L86)
 L116 0 SEA ABB=ON PLU=ON L113 AND (L85 OR L86)
 L117 QUE ABB=ON PLU=ON CENTIGRAD? OR CELCIUS? OR DEG? (A) C
 L118 1 SEA ABB=ON PLU=ON L117 AND L113
 D SCAN
 L119 2 SEA ABB=ON PLU=ON L117 AND L112
 L120 1 SEA ABB=ON PLU=ON L117 AND L114
 L121 2 SEA ABB=ON PLU=ON (L118 OR L119 OR L120)
 D SCAN

FILE 'HCAPLUS' ENTERED AT 13:29:41 ON 17 AUG 2005

L122 301584 SEA ABB=ON PLU=ON L3
 L123 33628 SEA ABB=ON PLU=ON L3/P
 L124 6045 SEA ABB=ON PLU=ON (L122 OR HYDROGEN OR H2 OR H) (L)L77
 L125 21754 SEA ABB=ON PLU=ON (L122 OR HYDROGEN OR H2 OR H) (L)L73
 L126 127675 SEA ABB=ON PLU=ON L4
 L127 474526 SEA ABB=ON PLU=ON L126 OR METHANOL? OR CH3OH OR MEOH
 OR METHY (A) ALCOHOL?
 L128 87588 SEA ABB=ON PLU=ON L5
 L129 238514 SEA ABB=ON PLU=ON L128 OR PALLADIUM? OR PD
 L130 155473 SEA ABB=ON PLU=ON L6
 L131 579372 SEA ABB=ON PLU=ON L130 OR TITANIUM OR TI
 L132 163618 SEA ABB=ON PLU=ON L8
 L133 950 SEA ABB=ON PLU=ON L129 AND L77
 L134 902 SEA ABB=ON PLU=ON L131 AND L77
 L135 1063 SEA ABB=ON PLU=ON (L8 OR SILVER OR AG) AND L77
 L136 489861 SEA ABB=ON PLU=ON L***

FILE 'REGISTRY' ENTERED AT 13:57:52 ON 17 AUG 2005

E 7740-50-8/RN
 E 7440-50-8/RN
 L137 1 SEA ABB=ON PLU=ON 7440-50-8/RN
 D SCAN

FILE 'HCAPLUS' ENTERED AT 13:58:57 ON 17 AUG 2005

L138 1082 SEA ABB=ON PLU=ON (L137 OR COPPER OR CU) AND L77
 L139 83983 SEA ABB=ON PLU=ON L11
 L140 1769 SEA ABB=ON PLU=ON (L139 OR VANADIUM OR V) AND L77
 L141 46743 SEA ABB=ON PLU=ON L13
 L142 2410 SEA ABB=ON PLU=ON (L141 OR LANTHANUM OR LA) AND L77
 L143 312426 SEA ABB=ON PLU=ON L14
 L144 3793 SEA ABB=ON PLU=ON (L143 OR NI OR NICKEL) AND L77
 L145 1784 SEA ABB=ON PLU=ON (L16 OR IRON OR FE) AND L77
 L146 182316 SEA ABB=ON PLU=ON L18
 L147 1264 SEA ABB=ON PLU=ON (L146 OR CHROMIUM OR CR) AND L77
 L148 8279 SEA ABB=ON PLU=ON (L133 OR L134 OR L135) OR L138 OR
 L140 OR L142 OR L144 OR L145 OR L147
 L149 109 SEA ABB=ON PLU=ON L148 AND HYDRID?
 L150 6 SEA ABB=ON PLU=ON L149 AND SUPPORT?
 D SCAN
 L151 7774 SEA ABB=ON PLU=ON (L129 OR L131 OR L139 OR L141 OR
 L143 OR L146 OR L137 OR L32 OR L6) AND L73
 L152 18969 SEA ABB=ON PLU=ON (SILVER OR AG OR COPPER OR CU OR
 VANADIUM OR V OR LANTHANUM OR LA OR NI OR NICKEL OR IRON
 OR FE OR CHROMIUM OR CR) AND L73
 L153 20530 SEA ABB=ON PLU=ON L151 OR L152
 L154 138 SEA ABB=ON PLU=ON L153 AND ((L78 OR L79 OR L80))
 L155 0 SEA ABB=ON PLU=ON L154 AND L85
 L156 7 SEA ABB=ON PLU=ON L154 AND L86
 L157 50 SEA ABB=ON PLU=ON L154 AND L87
 L158 5 SEA ABB=ON PLU=ON L156 AND L87
 L159 301 SEA ABB=ON PLU=ON L148 AND (L85 OR L86)
 L160 4 SEA ABB=ON PLU=ON L148 AND L85
 L161 297 SEA ABB=ON PLU=ON L148 AND L86
 L162 0 SEA ABB=ON PLU=ON L148 AND (L85 AND L86)
 L163 107 SEA ABB=ON PLU=ON L161 AND L87
 L164 0 SEA ABB=ON PLU=ON L163 AND L100
 L165 0 SEA ABB=ON PLU=ON L161 AND L100
 L166 0 SEA ABB=ON PLU=ON L161 AND L104
 L167 0 SEA ABB=ON PLU=ON L163 AND L104
 L168 0 SEA ABB=ON PLU=ON L159 AND (L100 OR L104)
 L169 49 SEA ABB=ON PLU=ON L148 AND (L100 OR L104)
 D QUE
 L170 0 SEA ABB=ON PLU=ON L169 AND HYDRID?
 L171 0 SEA ABB=ON PLU=ON L154 AND (L100 OR L104)

L172 72 SEA ABB=ON PLU=ON L153 AND (L100 OR L104)
 D QUE
 D QUE L151

L173 8232 SEA ABB=ON PLU=ON (L129 OR L131 OR L139 OR L141 OR
 L143 OR L146 OR L137 OR L132 OR L6) AND L73

L174 20536 SEA ABB=ON PLU=ON L173 OR L152
 D QUE
 140 SEA ABB=ON PLU=ON L174 AND ((L78 OR L79 OR L80))

L176 7 SEA ABB=ON PLU=ON L175 AND (L85 OR L86)

L177 51 SEA ABB=ON PLU=ON L175 AND L87

L178 51 SEA ABB=ON PLU=ON L177 AND SUPPORT?

L179 0 SEA ABB=ON PLU=ON L178 AND (L100 OR L104)

L180 3 SEA ABB=ON PLU=ON L178 AND L117
 D SCAN

L181 1 SEA ABB=ON PLU=ON L178 AND HYDRID?
 D SCAN
 D KWIC

L182 17 SEA ABB=ON PLU=ON L178 AND ALLOY?

L183 34 SEA ABB=ON PLU=ON L21

L184 277 SEA ABB=ON PLU=ON L183 OR PDAG OR AGPD

L185 3692 SEA ABB=ON PLU=ON L22

L186 2 SEA ABB=ON PLU=ON L24
 D SCAN

L187 59 SEA ABB=ON PLU=ON L25

L188 3841 SEA ABB=ON PLU=ON L186 OR L187 OR PDCU OR CUPD OR
 CU(A) PD

L189 6226 SEA ABB=ON PLU=ON L184 OR PD(A)AG
 D 1-10 KWIC

L190 1231 SEA ABB=ON PLU=ON L26

L191 4463 SEA ABB=ON PLU=ON L188 OR L190

L192 1755 SEA ABB=ON PLU=ON L27

L193 2529 SEA ABB=ON PLU=ON L192 OR LANI5 OR NI5LA

L194 831 SEA ABB=ON PLU=ON L19

L195 11602 SEA ABB=ON PLU=ON L194 OR TIFE OR FETI OR FE(A)TI

L196 6 SEA ABB=ON PLU=ON L28

L197 567 SEA ABB=ON PLU=ON L31

L198 15 SEA ABB=ON PLU=ON L196 OR CRV2 OR V2CR
 D SCAN

L199 576 SEA ABB=ON PLU=ON L197 OR L198

L200 157 SEA ABB=ON PLU=ON L32

L201 715 SEA ABB=ON PLU=ON L200 OR (V(A)TI) (A)NI OR (V(A)NI) (A)T
 I OR (NI(A)TI) (A)V

L202 779 SEA ABB=ON PLU=ON L33

L203 5002 SEA ABB=ON PLU=ON V(A)NI
 D 1-10 KWIC

L204 1079 SEA ABB=ON PLU=ON L34

L205 290 SEA ABB=ON PLU=ON L186 OR L187 OR PDCU OR CUPD

L206 97225 SEA ABB=ON PLU=ON L128 OR (L183 OR L184 OR L185 OR
 L186 OR L187) OR L190 OR (L192 OR L193 OR L194) OR TIFE
 OR FETI OR (L196 OR L197 OR L198 OR L199 OR L200) OR
 L202 OR (L204 OR L205)

L207 11082 SEA ABB=ON PLU=ON (L183 OR L184 OR L185 OR L186 OR
 L187) OR L190 OR (L192 OR L193 OR L194) OR TIFE OR FETI
 OR (L196 OR L197 OR L198 OR L199 OR L200) OR L202 OR
 (L204 OR L205)

L208 672 SEA ABB=ON PLU=ON L206 AND L77

L209 79 SEA ABB=ON PLU=ON L207 AND L77
 D QUE L89

L210 208 SEA ABB=ON PLU=ON L81 OR L82 OR L84 OR (L112 OR L113
 OR L114) OR L121

L211 43 SEA ABB=ON PLU=ON L81 OR L97 OR (L112 OR L113 OR L114)
 OR L121

L212 251 SEA ABB=ON PLU=ON L82 OR L84 OR L92 OR L93 OR L99 OR
 L108

L213 251 SEA ABB=ON PLU=ON (L210 OR L211 OR L212)

L214 24 SEA ABB=ON PLU=ON L213 AND L206

D SCAN TI
L215 0 SEA ABB=ON PLU=ON L214 AND L1
L216 56 SEA ABB=ON PLU=ON L175 AND L213
L217 69 SEA ABB=ON PLU=ON L72
L218 181 SEA ABB=ON PLU=ON L68
L219 181 SEA ABB=ON PLU=ON L217 OR L218
L220 43325 SEA ABB=ON PLU=ON PYROPHOSPHAT?
D 1-10 KWIC
L221 128841 SEA ABB=ON PLU=ON CONDUCTOR? OR CONDUCTANT?
L222 2211 SEA ABB=ON PLU=ON L73 AND L221
L223 26380 SEA ABB=ON PLU=ON L222 OR L77
D QUE
D QUE
L224 15515 SEA ABB=ON PLU=ON MESOPOR?
L225 85 SEA ABB=ON PLU=ON ZIRCONIUM(3A) PHOSPHAT? (3A) PYROPHOSPHAT? OR ZR(3A) PO4 (3A) P2O7 OR ZR(A) PO4 OR ZR(A) P2O7
L226 4258 SEA ABB=ON PLU=ON ZIRCONIUM(A) PHOSPHAT? OR ZIRCONIUM(A) PYROPHOSPHAT?
L227 12 SEA ABB=ON PLU=ON ZIRCONIUM(2A) PHOSPHAT? (2A) PYROPHOSPHAT?
D SCAN
L228 9 SEA ABB=ON PLU=ON ZR(A) P2O7
L229 10 SEA ABB=ON PLU=ON ZR(2A) P2O7
L230 19 SEA ABB=ON PLU=ON (L227 OR L228)
L231 2 SEA ABB=ON PLU=ON L224 (2A) L230
L232 2 SEA ABB=ON PLU=ON L224 (2A) L225
D SCAN
L233 13 SEA ABB=ON PLU=ON L224 (2A) L226
D SCAN
L234 13 SEA ABB=ON PLU=ON (L231 OR L232 OR L233)
L235 0 SEA ABB=ON PLU=ON L213 AND L234
L236 0 SEA ABB=ON PLU=ON L213 AND L234
L237 1204 SEA ABB=ON PLU=ON MESO(A) POR?
L238 791 SEA ABB=ON PLU=ON MESO(A) (PORE? OR POROUS? OR PORUS?)
D 1-20 KWIC
L239 16007 SEA ABB=ON PLU=ON L224 OR L238
L240 4278 SEA ABB=ON PLU=ON L225 OR L226 OR L230
L241 14 SEA ABB=ON PLU=ON L240 (3A) L239
L242 0 SEA ABB=ON PLU=ON L213 AND L241
L243 0 SEA ABB=ON PLU=ON L213 AND L239
L244 1 SEA ABB=ON PLU=ON L213 AND L240
D SCAN
L245 89 SEA ABB=ON PLU=ON L77 AND L240
L246 46 SEA ABB=ON PLU=ON L77 AND L239
D 1-10 KWIC
D QUE L241
D QUE L226
D QUE L22
D QUE L225
L247 17 SEA ABB=ON PLU=ON ZIRCONIUM(4A) PHOSPHAT? (4A) PYROPHOS?
D 1-10 KWIC
L248 4990 SEA ABB=ON PLU=ON ZIRCONIUM(4A) PHOSPHAT?
D 1-10 KWIC
L249 206 SEA ABB=ON PLU=ON ZIRCONIUM(4A) PYROPHOS?
L250 12 SEA ABB=ON PLU=ON ZR(3A) P2O7
L251 13 SEA ABB=ON PLU=ON ZR(4A) P2O7
D 1-13 KWIC
L252 13 SEA ABB=ON PLU=ON ZR(5A) P2O7
L253 197 SEA ABB=ON PLU=ON ZR(3A) PO4
D 1-13 KWIC
L254 221 SEA ABB=ON PLU=ON ZR(4A) PO4
D 1-13 KWIC
L255 5189 SEA ABB=ON PLU=ON (L247 OR L248 OR L249 OR L250 OR L251 OR L252 OR L253 OR L254)
L256 5262 SEA ABB=ON PLU=ON L219 OR L255
L257 20 SEA ABB=ON PLU=ON L239 (4A) L256

L258	0	SEA ABB=ON	PLU=ON	L257 AND L213
L259	25	SEA ABB=ON	PLU=ON	L239(6A) L256
L260	0	SEA ABB=ON	PLU=ON	L259 AND L213
L261	1	SEA ABB=ON	PLU=ON	L246 AND L256 D SCAN
L262	89	SEA ABB=ON	PLU=ON	L245 AND L256
L263	153	SEA ABB=ON	PLU=ON	L245 OR L246 OR L257 OR L261 OR L262 D QUE L245 D QUE L246 D QUE L257 D QUE L261 D QUE L262
L264	134	SEA ABB=ON	PLU=ON	L246 OR L261 OR L262 D QUE L246 D QUE L262
L265	1	SEA ABB=ON	PLU=ON	L246 AND L262 D SCAN
L266	37	SEA ABB=ON	PLU=ON	L239(L) L256
L267	1	SEA ABB=ON	PLU=ON	L266 AND L73 D SCAN
L268	3	SEA ABB=ON	PLU=ON	L35 D SCAN
L269	83	SEA ABB=ON	PLU=ON	L38
L270	84	SEA ABB=ON	PLU=ON	L268 OR L269
L271	0	SEA ABB=ON	PLU=ON	L270 AND L213
L272	16	SEA ABB=ON	PLU=ON	L270 AND L77
L273	20	SEA ABB=ON	PLU=ON	L270 AND L73
L274	20	SEA ABB=ON	PLU=ON	L272 OR L273 D SCAN TI
L275	1398	SEA ABB=ON	PLU=ON	L39
L276	38	SEA ABB=ON	PLU=ON	L40
L277	4	SEA ABB=ON	PLU=ON	L41
L278	1099	SEA ABB=ON	PLU=ON	L42 D SCAN L277
L279	1400	SEA ABB=ON	PLU=ON	(L275 OR L276 OR L277 OR L278)
L280	0	SEA ABB=ON	PLU=ON	L213 AND L279
L281	23	SEA ABB=ON	PLU=ON	L279 AND L77
L282	8	SEA ABB=ON	PLU=ON	L279 AND L222
L283	23	SEA ABB=ON	PLU=ON	L279 AND L223
L284	23	SEA ABB=ON	PLU=ON	(L281 OR L282 OR L283)
L285	23	SEA ABB=ON	PLU=ON	L279 AND L73
L286	23	SEA ABB=ON	PLU=ON	L284 OR L285
L287	8574	SEA ABB=ON	PLU=ON	L43
L288	736	SEA ABB=ON	PLU=ON	L44
L289	642	SEA ABB=ON	PLU=ON	L45 D QUE L287
L290	18	SEA ABB=ON	PLU=ON	((L287 OR L288 OR L289)) AND L223
L291	44	SEA ABB=ON	PLU=ON	((L287 OR L288 OR L289)) AND L73
L292	173	SEA ABB=ON	PLU=ON	L46
L293	1	SEA ABB=ON	PLU=ON	L292 AND L223
L294	1	SEA ABB=ON	PLU=ON	L292 AND L73
L295	4	SEA ABB=ON	PLU=ON	SILVER(3A) IODIDE(3A) TETRATUNGSTATE
L296	0	SEA ABB=ON	PLU=ON	L295 AND L223 D 295 1-4 KWIC D 295 1-4 KWIC D L295 1-4 KWIC
L297	26	SEA ABB=ON	PLU=ON	L47
L298	19485	SEA ABB=ON	PLU=ON	L297 OR KH2PO4 D 1-10 KWIC
L299	13	SEA ABB=ON	PLU=ON	L298 AND L223
L300	16	SEA ABB=ON	PLU=ON	L298 AND L73
L301	421	SEA ABB=ON	PLU=ON	L48
L302	2	SEA ABB=ON	PLU=ON	L301 AND L223
L303	3	SEA ABB=ON	PLU=ON	L301 AND L73
L304	57	SEA ABB=ON	PLU=ON	L49

L305	3 SEA ABB=ON	PLU=ON	L51
L306	1 SEA ABB=ON	PLU=ON	(L304 OR L305) AND L223
L307	1 SEA ABB=ON	PLU=ON	(L304 OR L305) AND L73
L308	46 SEA ABB=ON	PLU=ON	CSDSO4
L309	0 SEA ABB=ON	PLU=ON	L308 AND L223
L310	0 SEA ABB=ON	PLU=ON	L308 AND L73
L311	547 SEA ABB=ON	PLU=ON	L50
L312	5 SEA ABB=ON	PLU=ON	L52
L313	574 SEA ABB=ON	PLU=ON	L311 OR L312 OR CSH2PO4
L314	10 SEA ABB=ON	PLU=ON	L313 AND L223
L315	10 SEA ABB=ON	PLU=ON	L313 AND L73
L316	67 SEA ABB=ON	PLU=ON	L53
L317	8 SEA ABB=ON	PLU=ON	L316 AND L223
L318	8 SEA ABB=ON	PLU=ON	L316 AND L73
L319	9 SEA ABB=ON	PLU=ON	L58
L320	9 SEA ABB=ON	PLU=ON	SILICA(3A) POLYPHOS? (3A) AMMONIUM
L321	1 SEA ABB=ON	PLU=ON	L320 AND L223
L322	1 SEA ABB=ON	PLU=ON	L320 AND L73
L323	82 SEA ABB=ON	PLU=ON	SILICA(3A)? PHOSPHAT? (3A) AMMONIUM
L324	1 SEA ABB=ON	PLU=ON	L58 AND L223
L325	1 SEA ABB=ON	PLU=ON	L58 AND L73
L326	1 SEA ABB=ON	PLU=ON	L323 AND L223
L327	1 SEA ABB=ON	PLU=ON	L323 AND L73
L328	5 SEA ABB=ON	PLU=ON	L66
L329	1 SEA ABB=ON	PLU=ON	L328 AND L73
L330	16 SEA ABB=ON	PLU=ON	L67
L331	11 SEA ABB=ON	PLU=ON	L330 AND L73
L332	11 SEA ABB=ON	PLU=ON	L330 AND L223
L333	1343 SEA ABB=ON	PLU=ON	L223 AND (MU? (W) M OR MICRON? OR MICROMETER? OR MICROMETR? OR MICRO(A) (METER? OR METR?))
L334	1343 SEA ABB=ON	PLU=ON	L333 AND L223
L335	17 SEA ABB=ON	PLU=ON	L333 AND L213
L336	7092 SEA ABB=ON	PLU=ON	L223 AND (FACE? OR SIDE? OR SURFACE?)
L337	441 SEA ABB=ON	PLU=ON	L336 AND L86
L338	2 SEA ABB=ON	PLU=ON	L337 AND GAP
	D SCAN		
L339	107 SEA ABB=ON	PLU=ON	L337 AND TEMP?
L340	15 SEA ABB=ON	PLU=ON	L339 AND SUPPORT?
L341	0 SEA ABB=ON	PLU=ON	L337 AND L85
L342	7 SEA ABB=ON	PLU=ON	L336 AND L85
L343	22 SEA ABB=ON	PLU=ON	L340 OR L342
L344	6 SEA ABB=ON	PLU=ON	L343 AND (METAL? OR HYDRID?)
	D SCAN		
L345	157 SEA ABB=ON	PLU=ON	L223 AND GAP
L346	30 SEA ABB=ON	PLU=ON	L345 AND TEMP?
L347	69 SEA ABB=ON	PLU=ON	L335 OR L338 OR L340 OR (L342 OR L343 OR L344) OR L346
L348	55 SEA ABB=ON	PLU=ON	L347 AND TEMP?
L349	126 SEA ABB=ON	PLU=ON	L223 AND (PERCENT? OR PCT? OR PER(A) CENT?)
L350	26 SEA ABB=ON	PLU=ON	L349 AND (WEIGHT? OR WT?)
L351	4 SEA ABB=ON	PLU=ON	L348 AND (WEIGHT? OR WT?)
L352	51 SEA ABB=ON	PLU=ON	L150 OR L158 OR (L180 OR L181 OR L182) OR L214 OR L244 OR L265 OR L267
L353	20 SEA ABB=ON	PLU=ON	(L272 OR L273 OR L274)
L354	58 SEA ABB=ON	PLU=ON	L286 OR L290 OR L293 OR L294 OR L299 OR L300 OR L302 OR L303 OR L306
L355	30 SEA ABB=ON	PLU=ON	L307 OR L314 OR L317 OR L321 OR L324 OR L326 OR L329 OR L332
L356	30 SEA ABB=ON	PLU=ON	L350 OR L351
L357	182 SEA ABB=ON	PLU=ON	(L352 OR L353 OR L354 OR L355 OR L356)
L358	241 SEA ABB=ON	PLU=ON	L357 OR L347
L359	230 SEA ABB=ON	PLU=ON	L358 AND L223
	D QUE		

L360 76 SEA ABB=ON PLU=ON L359 AND SUPPORT?
 L361 197 SEA ABB=ON PLU=ON L359 AND (METAL? OR HYDRID? OR L85
 OR L86 OR L100 OR L104 OR FACE? OR SIDE? OR SURFACE? OR
 TEMP?)
 L362 73 SEA ABB=ON PLU=ON L361 AND SUPPORT?
 L363 101 SEA ABB=ON PLU=ON L148 AND L361
 L364 13 SEA ABB=ON PLU=ON L361 AND L149
 L365 80 SEA ABB=ON PLU=ON L362 OR L364
 D QUE L175
 L366 30 SEA ABB=ON PLU=ON L361 AND L175
 L367 80 SEA ABB=ON PLU=ON L365 OR L366
 D QUE L206
 L368 35 SEA ABB=ON PLU=ON L361 AND L208
 L369 89 SEA ABB=ON PLU=ON L367 OR L368
 L370 56 SEA ABB=ON PLU=ON L361 AND L213
 L371 96 SEA ABB=ON PLU=ON L369 OR L370
 L372 3 SEA ABB=ON PLU=ON L361 AND L245
 L373 98 SEA ABB=ON PLU=ON L371 OR L372
 D QUE L263
 D QUE L264
 L374 6 SEA ABB=ON PLU=ON L361 AND L264
 L375 99 SEA ABB=ON PLU=ON L373 OR L374
 L376 10 SEA ABB=ON PLU=ON L361 AND L314
 L377 105 SEA ABB=ON PLU=ON L375 OR L376
 L378 16 SEA ABB=ON PLU=ON L361 AND (L317 OR L321 OR L324 OR
 L326 OR L329 OR L331)
 L379 116 SEA ABB=ON PLU=ON L377 OR L378

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L379 ANSWER 1 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2005:741752 Development of Nafion-/SiO₂/phosphotungstic acid

nanocomposite membranes for high temperature proton exchange membrane fuel cells. Liu, Yuxiu; Kunz, H. Russell; Fenton, James M.; Zhu, Lei (Polymer Program, Institute of Materials Science and Department of Chemical Engineering, University of Connecticut, Storrs, CT, 06269, USA). Abstracts of Papers, 230th ACS National Meeting, Washington, DC, United States, Aug. 28-Sept. 1, 2005, PMSE-414. American Chemical Society: Washington, D. C. (English) 2005. CODEN: 69HFCL.

AB Research has been conducted to improve the conductivity of Nafion--based nanocomposite membranes for proton exchange membrane (PEM) fuel cells at high temperature and low relative humidity. 3-Aminopropyl triethoxysilane (APTES) modified mesoporous silica (SBA-15) was used to immobilize phosphotungstic acid (PTA) through ionic complexation processes. These composites were denoted as SAP. Thermogravimetric anal. (TGA) was used to determine the APTES functionalization ratio and PTA immobilization percentage. TGA results indicated that PTA was successfully immobilized, and the highest loading on porous silica was ca. 67 weight%. Nafion- membranes with different SAP contents (denoted as NSAP) were cast from 5 weight% ethanol solution at 70 °C. Small-angle X-ray scattering results on the SAP composites revealed hexagonal cylinder morphol., which was further confirmed by transmission electron microscopy. DC conductivity measurements at various temps. and relative humidities showed slightly higher conductivity for the NSAP membranes than the recast Nafion- membrane.

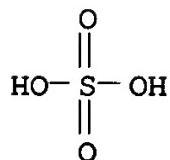
L379 ANSWER 2 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2005:638259 Polymer nanocomposite membranes, their manufacture, and their use for membrane-electrode assemblies and polymer electrolyte fuel cells. Lee, Hee-Wu; Song, Ming-Gyu; Kim, Young-Taek; Park, Seung-Bae; Park, Jin-Ki (Hyundai Motor Corp., S. Korea; Kia Motors Corp.). Jpn. Kokai Tokkyo Koho JP 2005197209 A2 20050721, 16 pp. (Japanese). CODEN:

JKXXAF. APPLICATION: JP 2004-258793 20040906. PRIORITY: KR
2003-100130 20031230.

AB The polymer nanocomposite membranes comprise 30-95 weight% matrixes comprising ion-exchange resins having cation-exchange groups in side chains and 5-70 weight% finely and uniformly dispersed powders of solid H⁺ conductors. The polymer nanocomposite membranes are manufactured by (a) dissolving ion-exchange resins having cation-exchange groups in side chains into organic solvents to produce ion-exchange resin solns. (concentration 0.5-30 weight%), (b) mixing the solns. with porogens under high-frequency ultrasonic waves and forming polymer membranes, (c) extracting the porogens from the polymer membranes to form nanopores, and (d) filling the nanopores with solid H⁺ conductors so that 5-70 weight% of the solid H⁺ conductors are dispersed in 30-95 wt % of the ion-exchange resins. The nanocomposite membranes have high elec. conductivity at high temperature, good mech. properties, dimensional stability, and high fuel-separation performance are useful for membrane-electrode assemblies for polymer electrolyte fuel cells.

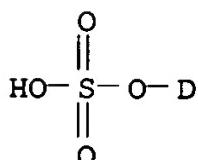
IT 7789-16-4, Cesium hydrogen sulfate 93487-19-5,
Cesium deuterium sulfate
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(proton conductor; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

RN 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 93487-19-5 HCAPLUS
CN Sulfuric acid-d, monocesium salt (9CI) (CA INDEX NAME)



● Cs

IC ICM H01M008-02
ICS H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST cation exchanger proton conductor
nanocomposite membrane; polymer electrolyte fuel

IT **cell nanocomposite membrane**
Polyimides
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(coating on nanocomposite membrane; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Glycols**
RL: NUU (Other use, unclassified); USES (Uses)
(ethers, solvent; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Polyoxyalkylenes**
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, ionomers, Nafion; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Ethers**
RL: NUU (Other use, unclassified); USES (Uses)
(glycol, solvent; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Cation exchangers**
Fuel cell electrolytes
Ionic conductors
Membranes, nonbiological
Nanocomposites
Porogens
(manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Fluoropolymers**
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Solvents**
(organic; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Fuel cells**
(polymer electrolyte; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Fluoropolymers**
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers, Nafion; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)

IT **Ionomers**

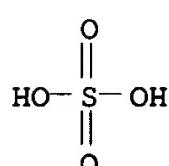
- RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
- (polyoxyalkylenes, fluorine- and sulfo-containing, Nafion; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT Polyesters
- RL: NUU (Other use, unclassified); USES (Uses)
- (porogen; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT Clays
- Mica-group minerals
- Zeolites (synthetic)
- RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
- (support for proton conductor; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT Phosphosilicate glasses
- RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
- (zirconium phosphosilicate, proton conductor; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 9002-86-2, Poly(vinyl chloride) 24937-79-9, Poly(vinylidene fluoride) 24981-14-4, Poly(vinyl fluoride)
- RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
- (coating on nanocomposite membrane; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 7631-86-9, Silica
- RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
- (glass component, support for proton conductor; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 1314-23-4, Zirconia 1314-56-3, Phosphorus pentoxide
- RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
- (glass component; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 96-49-1, Ethylene carbonate 105-58-8, Diethyl carbonate
108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate
- RL: NUU (Other use, unclassified); USES (Uses)
- (porogen, solvent; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 84-74-2, Dibutyl phthalate 103-23-1, Dioctyl adipate 117-81-7,
Dioctyl phthalate 1330-78-5, Tritolyt phosphate 9003-53-6,

- Polystyrene 19295-81-9, Heptyl nonyl phthalate 24980-41-4,
 Polycaprolactone 25248-42-4, Polycaprolactone 27554-26-3
 RL: NUU (Other use, unclassified); USES (Uses)
 (porogen; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 13772-29-7P
 RL: DEV (Device component use); IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PYP (Physical process); PREP (Preparation); PROC (Process); USES (Uses)
 (proton conductor; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 1314-60-9, Antimony pentoxide 7789-16-4, Cesium hydrogen sulfate 12209-84-6, Antimony nitrate oxide (Sb₄(NO₃)₂₀₅) 18282-10-5, Tin dioxide 93487-19-5, Cesium deuterium sulfate 107069-88-5, Antimony hydroxide oxide phosphate (Sb₃(OH)₃₀₃(PO₄)₂) 107250-82-8, hydrogen titanium oxide (H₂Ti₄O₉) 142487-25-0 165901-90-6 210536-75-7 307943-55-1, Uranium arsenate oxide (U(HAsO₄)₂) 307943-57-3, Uranium oxide phosphate (UO₂(HPO₄)) 860020-46-8 860020-47-9 860020-48-0
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (proton conductor; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 60-29-7, Diethyl ether 64-17-5, Ethanol 67-56-1, Methanol 67-63-0, 2-Propanol 67-64-1, Acetone 67-68-5, Dimethyl sulfoxide 68-12-2, Dimethylformamide 78-59-1, Isophorone 78-93-3, Methyl ethyl ketone 96-48-0, Butyrolactone 108-10-1, Methyl isobutyl ketone 108-83-8, Diisobutyl ketone 108-94-1, Cyclohexanone 109-99-9, Tetrahydrofuran 112-15-2, Carbitol acetate 115-10-6, Dimethyl ether 123-42-2, Diacetone alcohol 123-86-4, N-Butyl acetate 127-19-5, Dimethylacetamide 141-97-9, Ethyl acetoacetate 512-56-1, Trimethyl phosphate 632-22-4, Tetramethylurea 872-50-4, N-Methyl-2-pyrrolidone
 RL: NUU (Other use, unclassified); USES (Uses)
 (solvent; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- IT 1344-28-1, Alumina
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (support for proton conductor; manufacture of porous polymer-solid proton conductor nanocomposite membranes for membrane-electrode assemblies and polymer electrolyte fuel cells)
- L379 ANSWER 3 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2005:591653 Document No. 143:81245 Method for manufacture of proton-conductive solid electrolyte films for fuel cells showing high operating temperature. Otomo, Junichiro; Takahashi, Hiroshi; Ogura, Masaru; Wang, Ju-Jiang; Kobayashi, Takeshi; Waki, Keiko; Nagamoto, Hidetoshi (Tokyo University, Japan). Jpn. Kokai Tokkyo Koho JP 2005183121 A2 20050707, 9 pp. (Japanese). CODEN: JKXXAF.
 APPLICATION: JP 2003-420994 20031218.
- AB The method includes preparing silica thin films having open nanopores on main surfaces, preparing aqueous solns. or melts containing CsHSO₄ (I) and/or CsH₂PO₄ (II), and impregnating the nanopores

with the solns. or melts to form solid electrolyte films comprising I and/or II. Fuel cells using the solid electrolyte films show operating temperature $\geq 150^\circ$.

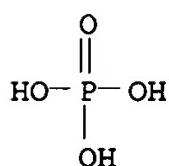
IT 7789-16-4, Cesium hydrogen sulfate 18649-05-3,
Cesium dihydrogen phosphate
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); TEM (Technical or
engineered material use); PROC (Process); USES (Uses)
(electrolytes; manufacture of proton-
conductive solid electrolyte films for
fuel cells showing high operating temp
.)

RN 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

IC ICM H01B013-00
ICS H01B001-06; H01M008-02; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST cesium hydrogen sulfate nanoporous silica solid electrolyte
film; nanoporous silica film solid electrolyte cesium
dihydrogen phosphate; fuel cell solid
electrolyte proton conductor
IT Fuel cell electrolytes
Solid electrolytes
(manufacture of proton-conductive solid
electrolyte films for fuel cells
showing high operating temperature)
IT Ionic conductors
(protonic; manufacture of proton-
conductive solid electrolyte films for
fuel cells showing high operating temp
.)
IT Fuel cells
(solid electrolyte; manufacture of proton-
conductive solid electrolyte films for
fuel cells showing high operating temp
.)

- IT 7789-16-4, Cesium hydrogen sulfate 18649-05-3,
Cesium dihydrogen phosphate
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); TEM (Technical or
engineered material use); PROC (Process); USES (Uses)
(electrolytes; manufacture of proton-
conductive solid electrolyte films for
fuel cells showing high operating temp
.)
- IT 7631-86-9, Silica, uses
RL: DEV (Device component use); TEM (Technical or engineered
material use); USES (Uses)
(nanoporous film supports; manufacture of proton-
conductive solid electrolyte films for
fuel cells showing high operating temp
.)

L379 ANSWER 4 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:552858 Effect of water vapor on proton conduction
of cesium dihydrogen phosphate and application to intermediate
temperature fuel cells. Otomo, Junichiro; Tamaki, Takanori;
Nishida, Satoru; Wang, Shuqiang; Ogura, Masaru; Kobayashi, Takeshi;
Wen, Ching-ju; Nagamoto, Hidetoshi; Takahashi, Hiroshi (Department
of Environmental Chemical Engineering, Faculty of Engineering,
Kogakuin University, Hachioji-city, Tokyo, 192-0015, Japan).
Journal of Applied Electrochemistry, 35(9), 865-870 (English) 2005.
CODEN: JAELBJ. ISSN: 0021-891X. Publisher: Springer.

AB The proton conduction and superionic phase
transition of cesium dihydrogen phosphate, CsH_2PO_4 (CDP),
were investigated under various humid conditions to evaluate the
applicability of a CsH_2PO_4 solid electrolyte to
an intermediate temperature fuel cell
operating between 230 °C and 300 °C. The phase
stability, superionic phase transition, and reversibility of
dehydration of CsH_2PO_4 were evaluated under different
ambient water vapor concns., from 0 to 90 mol%, through the
measurements of conductivity. The dependence of conductivity on the water vapor
concentration and the demonstrated reversibility of dehydration clearly
showed the range in which CsH_2PO_4 is applicable to the
intermediate temperature fuel cell. Addnl.,
we evaluated the protonic transport number of CsH_2PO_4 , which
was almost unity, and demonstrated fuel cell
operation at 250 °C using a single cell fabricated with the
 CsH_2PO_4 electrolyte.

CC 72 (Electrochemistry)

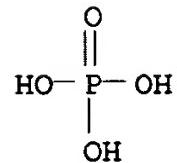
L379 ANSWER 5 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:452567 Document No. 143:46007 An intermediate temperature
proton-conducting electrolyte based on a
 $\text{CsH}_2\text{PO}_4/\text{SiP}207$ composite. Matsui, Toshiaki; Kukino,
Tomokazu; Kikuchi, Ryuji; Eguchi, Koichi (Department of Energy and
Hydrocarbon Chemistry, Graduate School of Engineering, Kyoto
University, Kyoto, 615-8510, Japan). Electrochemical and
Solid-State Letters, 8(5), A256-A258 (English) 2005. CODEN: ESLEF6.
ISSN: 1099-0062. Publisher: Electrochemical Society.

AB A p-conducting electrolyte based on a $\text{CsH}_2\text{PO}_4/\text{SiP}207$
composite was synthesized and its electrochem. properties were
studied at 110-287°. Addition of SiP207 as supporting
matrix brought about a structural change of the conducting phase,
 CsH_2PO_4 , into $\text{CsH}_5(\text{PO}_4)_2$. The resultant composite
electrolyte showed high thermal stability and conductivity under 30% $\text{H}_2\text{O}/\text{Ar}$
atmospheric. The maximum conductivity was 44 mS/cm at 266° and the
temperature dependence of the conductivity did not have the conductivity
irregularities of the CsH_2PO_4 -based composite.

IT 18649-05-3P, Cesium phosphate (CsH_2PO_4)
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or

engineered material use); PREP (Preparation); USES (Uses)
 (composite with silicon pyrophosphate; CsH₂PO₄/SiP207
 composite proton-conducting
 electrolyte for intermediate temperature fuel
 cells)

RN 18649-05-3 HCPLUS
 CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

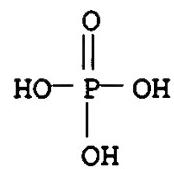
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST cesium phosphate silicon pyrophosphate composite electrolyte
 fuel cell
 IT Fuel cell electrolytes
 (CsH₂PO₄/SiP207 composite proton-conducting electrolyte for intermediate temperature fuel cells)
 IT Ionic conductors
 (protonic; CsH₂PO₄/SiP207 composite proton-conducting electrolyte for intermediate temperature fuel cells)
 IT 13827-38-8P, Silicon pyrophosphate (SiP207)
 RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); PREP (Preparation); USES (Uses)
 (composite with cesium phosphate; CsH₂PO₄/SiP207
 composite proton-conducting
 electrolyte for intermediate temperature fuel cells)
 IT 18649-05-3P, Cesium phosphate (CsH₂PO₄)
 RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); PREP (Preparation); USES (Uses)
 (composite with silicon pyrophosphate; CsH₂PO₄/SiP207
 composite proton-conducting
 electrolyte for intermediate temperature fuel cells)

L379 ANSWER 6 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2005:452563 Document No. 143:46005 Thin-membrane solid-acid fuel cell.
 Uda, Tetsuya; Haile, Sossina M. (Department of Materials Science,
 California Institute of Technology, Pasadena, CA, 91125, USA).
 Electrochemical and Solid-State Letters, 8(5), A245-A246 (English)
 2005. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

AB Solid-acid fuel cells (SAFCs) use an anhydrous, non-polymeric p conducting electrolyte and operate at slightly elevated temps. By supporting thin CsH₂PO₄ electrolyte membranes (25-36 μm), on porous stainless steel gas-diffusion electrodes, SAFCs with peak power densities ≤415 mW/cm² were obtained. Cells were operated at .apprx.240° with humidified H₂ supplied to the anode and humidified O₂ supplied to the cathode. Despite the thinness of the membranes, the open-circuit voltages were high, 0.91-1.01 V. SAFCs are competitive energy conversion devices.

IT 18649-05-3, Cesium phosphate (CsH₂PO₄)
 RL: DEV (Device component use); USES (Uses)
 (electrolyte; in thin membrane solid-acid fuel

cells)
RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT 12597-68-1, Stainless steel, uses
RL: DEV (Device component use); USES (Uses)
(electrode support; in thin membrane solid-acid fuel cells)
IT 18649-05-3, Cesium phosphate (CsH_2PO_4)
RL: DEV (Device component use); USES (Uses)
(electrolyte; in thin membrane solid-acid fuel cells)

L379 ANSWER 7 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:315268 Document No. 142:466376 CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer electrolyte fuel cells. Yoshida, Kotaro; Ishida, Masayoshi; Okada, Tatsuhiro (Graduate School of Systems and Information Engineering, University of Tsukuba, Tennoudai 1-1-1, Tsukuba, 305-8573, Japan). Electrochemistry (Tokyo, Japan), 73(4), 298-300 (Japanese) 2005. CODEN: EECTFA. ISSN: 1344-3542. Publisher: Electrochemical Society of Japan.
AB Fluorination is known to prohibit CO adsorption at LaNi5 group metal hydride. This characteristic was applied to fabricate a CO tolerant fluorinated Pt black catalyst by exposing it in diluted F2 gas. To test the CO tolerance, H2 oxidation current in H2 gas with fixed amount of CO was measured by using a half cell simulating the anode of a polymer electrolyte fuel cell. The results show that fluorinated Pt black, especially those treated in low F2 concentration (1%), improved CO tolerance. On the other hand, treating in high F2 concentration (10%) decreased the active surface area of Pt catalyst for H2 oxidation. These electrochem. characteristics together with the results in XPS spectra indicated that chemisorption of F, not the formation of Pt fluoride, improved the CO.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT Fuel cell anodes
(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer electrolyte fuel cells)
IT 7440-06-4, Platinum, uses
RL: CAT (Catalyst use); CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer electrolyte fuel cells)
IT 7782-41-4, Fluorine, uses
RL: MOA (Modifier or additive use); USES (Uses)
(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer electrolyte fuel cells)
IT 630-08-0, Carbon monoxide, miscellaneous
RL: MSC (Miscellaneous)
(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer electrolyte fuel cells)

L379 ANSWER 8 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2005:190841 Ba_{3-x}K_xHx(PO₄)₂:synthesis and properties of a new class of solid state proton conductors. Chisholm, Calum R. I.; Haile, Sossina M. (Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Abstracts of Papers, 229th ACS National Meeting, San Diego, CA, United States, March 13-17, 2005, INOR-451. American Chemical Society: Washington, D. C. (English) 2005. CODEN: 69GQMP.

AB Compds. with the general formula M+13H(XO₄), - M= Cs, Rb, NH₄ and X = S, Se are known to undergo superprotic transitions to trigonal structures with very high protonic conductivity (.apprx. 10-2 Ω-1cm-1), making them very appealing as solid state electrolytes in fuel cell. Unfortunately, these compds. are reduced when used as fuel cell electrolytes. Interestingly, phosphate analogs exist, with general formula M+23(PO₄)₂, which exhibit nearly identical trigonal structures. Moreover, the superprotic phosphate CsH₂PO₄ has recently been shown to be stable under fuel cell operational conditions. Compds. with stoichiometry Ba+23-xK+1xHx (PO₄)₂, 0 < x < 1, were therefore synthesized to combine the trigonal structure and chemical stability of Ba₃(PO₄)₂ with the superprotic conductivity of the M+13H(XO₄) compds. Indeed, the protonic conductivity of the Ba+23-xK+1xHx (PO₄)₂ compds. increased by 1000 times compared to that of Ba₃(PO₄)₂. However, the level of conductivity was still 100 times less than that expected for a superprotic phase due to local order within the structure, to be detailed in the talk. Figure 6. Conductivity of pure Ba₃(PO₄)₂ and three synthesized Ba_{3-x}K_xHx(PO₄)₂ compds.

L379 ANSWER 9 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2005:146193 Document No. 142:376429 Characterisation of intermediate temperature polyphosphate composites. Uma, T.; Tu, H. Y.; Freude, D.; Schneider, D.; Stimming, U. (Technische Universitaet Muenchen, Garching, D-85748, Germany). Journal of Materials Science, 40(1), 227-230 (English) 2005. CODEN: JMTSAS. ISSN: 0022-2461. Publisher: Springer.

AB Solid state proton conductors which show high conductivities in the medium temperature range (100 °C-200 °C) with low humidity are required as the electrolyte for polymer electrolyte fuel cells and direct methanol fuel cells operating in the temperature range. In the present work, amorphous ammonium silicon polyphosphate electrolytes were prepared from NH₄H₂PO₄ (ammonium dihydrogen phosphate), (NH₂)₂CO (urea), and tetraethoxysilane by the sol-gel method and evaluated for use as proton conductive materials at intermediate temps. The formation of (NH₄)₂SiP₄O₁₃ was confirmed by powder X-ray diffraction. The particle size of (NH₄)₂SiP₄O₁₃ was in the range 4-7 μm. ³¹P MAS NMR measurements showed that the phosphorus chain length of about 300 phosphate-units in (NH₄)₂SiP₄O₁₃ decreases upon processing to a value of 5 for (NH₄)₂SiP₄O₁₃ and increased again after activation up to 50. After an initial mass loss (mostly NH₃) of 3.5 % the material is thermally stable upon cycling between 50 °C and 300 °C. The conditioned conductivity values varied from 7.75 x 10-6 at 50 °C to 1.45 x 10-2 S cm-1 at 300 °C in dry nitrogen gas atmospheric

IT 61288-44-6P, Ammonium silicon (tetraphosphate) ((NH₄)₂Si(P₄O₁₃))
 RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)

(characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)

RN 61288-44-6 HCAPLUS

CN Ammonium silicon (tetraphosphate) ((NH₄)₂Si(P₄O₁₃)) (9CI) (CA INDEX

NAME)

Component	Ratio	Component Registry Number
O13P4	1	16132-64-2
H4N	2	14798-03-9
Si	1	7440-21-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49

ST fuel cell electrolyte ammonium silicon polyphosphate composite cond

IT Fuel cell electrolytes
 Heat treatment
 (characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)

IT Polyphosphates
 RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
 (characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)

IT Phosphates, preparation
 RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
 (silico-, ammonium salts; characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)

IT 61288-44-6P, Ammonium silicon (tetraphosphate) ((NH4)2Si(P4O13))
 RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
 (characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)

IT 57-13-6, Urea, reactions 78-10-4, Tetraethoxysilane 7722-76-1, Ammonium phosphate (NH4H2PO4)
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)

L379 ANSWER 10 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2005:108164 Document No. 142:357914 Proton conductivity of mesoporous sol-gel zirconium phosphates for fuel cell applications. Hogarth, Warren H. J.; Diniz da Costa, Joao C.; Drennan, John; Lu, G. Q. (Australian Research Council (ARC), Centre for Functional Nanomaterials, University of Queensland, Brisbane, 4072, Australia). Journal of Materials Chemistry, 15(7), 754-758 (English) 2005. CODEN: JMACEP. ISSN: 0959-9428. Publisher: Royal Society of Chemistry.

AB Zirconium phosphate was extensively studied as a proton conductor for proton exchange membrane (PEM) fuel cell applications. Here the authors report the synthesis of mesoporous, templated sol-gel zirconium phosphate for use in PEM applications in an effort to determine its suitability for use as a surface functionalized, solid acid proton conductor in the future. Mesoporous zirconium phosphates were synthesized using an acid-base pair mechanism with surface areas between 78 and 177 m² g⁻¹ and controlled pore sizes at 2-4 nm. TEM characterization confirmed the presence of a wormhole like pore

structure. The conductivity of such materials was up to $4.1 + 10^{-6}$ S cm⁻¹ at 22 °C and 84% relative humidity (RH), while humidity reduction resulted in a conductivity decrease by more than an order of magnitude. High temperature testing on the samples confirmed their dependence on hydration for proton conduction and low hydroscopic nature. While the conductivity of these materials is low compared to Nafion, they may be a good candidate as a surface functionalized solid acid proton conductor due to their high surface area, porous structure and inherent ability to conduct protons.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 67, 76

ST proton cond mesoporous sol
zirconium phosphate fuel cell

membrane

IT Pore size
(controlled to 2-4 nm; proton conductivity of
mesoporous sol-gel zirconium phosphates
for fuel cell applications)

IT Pore
(mesopore; proton conductivity of
mesoporous sol-gel zirconium phosphates
for fuel cell applications)

IT Pore size distribution
Pore structure
Sol-gel processing
(proton conductivity of mesoporous sol-gel
zirconium phosphates for fuel
cell applications)

IT Fuel cells
(proton exchange membrane, membrane materials for; proton
conductivity of mesoporous sol-gel zirconium
phosphates for fuel cell
applications)

IT Ionic conductivity
(proton; proton conductivity of
mesoporous sol-gel zirconium phosphates
for fuel cell applications)

IT 691397-13-4, Pluronic P 123
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP
(Physical, engineering or chemical process); REM (Removal or
disposal); PROC (Process); USES (Uses)
(porogen, Pluronic P 123, F 108 and F 127; proton
conductivity of mesoporous sol-gel zirconium
phosphates for fuel cell
applications)

IT 1119-97-7, Tetradecyltrimethylammonium bromide
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP
(Physical, engineering or chemical process); REM (Removal or
disposal); PROC (Process); USES (Uses)
(porogen; proton conductivity of mesoporous
sol-gel zirconium phosphates for fuel
cell applications)

IT 64-17-5, Ethanol, uses
RL: NUU (Other use, unclassified); USES (Uses)
(proton conductivity of mesoporous sol-gel
zirconium phosphates for fuel
cell applications)

IT 13765-95-2P, Zirconium phosphate
RL: PRP (Properties); SPN (Synthetic preparation); PREP
(Preparation)
(proton conductivity of mesoporous sol-gel
zirconium phosphates for fuel
cell applications)

IT 7719-12-2, Phosphorus trichloride 52892-19-0

RL: RCT (Reactant); RACT (Reactant or reagent)
 (proton conductivity of mesoporous sol-gel
 zirconium phosphates for fuel
 cell applications)

L379 ANSWER 11 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2005:75833 Document No. 142:138385 Hybrid organic-inorganic
 proton conductors, their manufacture, and
 membrane-electrode assemblies and fuel cells
 using them. Matsuo, Juho; Omichi, Takahiro (Teijin Ltd., Japan).
 Jpn. Kokai Tokkyo Koho JP 2005025945 A2 20050127, 25 pp.
 (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-186541 20030630.

AB The proton conductors comprise organic polymer
 proton conductors, and inorg. proton
 conductors comprising condensates of phosphoric acids, Lewis
 acidic metal alkoxides, and Si oxide precursors, e.g.,
 alkoxy silanes, where the organic and inorg. proton
 conductors form interpenetrating networks. In the manufacture,
 phosphoric acids were hydrolyzed and condensed with the alkoxides
 and the precursors in solvents, added to organic polymer proton
 conductor solns., and cast into films. The
 assemblies have the proton conductors sandwiched
 between catalyst electrodes containing metals
 supported on fine elec. conductive particles. The
 proton conductors show good flexibility, and
 oxidation and swelling resistance, resulting in fuel
 cells showing good dimensional stability.

IC ICM H01M008-02
 ICS C08G079-14; C08J005-22; C08L081-06; C08L085-00; H01B001-06;
 H01B013-00; H01M004-86; H01M008-10; C08G075-23

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 76

ST hybrid org inorg proton conductor
 interpenetrating network fuel cell; phosphoric
 acid condensate electrolyte fuel cell;
 Lewis acid metal alkoxide condensate electrolyte
 fuel cell; alkoxy silane condensate
 electrolyte fuel cell

IT Metal alkoxides
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP
 (Preparation); USES (Uses)
 (Lewis acidic, condensates with solid acids and silicon oxide
 precursors; manufacture of hybrid organic-inorg. proton
 conductors forming interpenetrating networks for
 membrane-electrode assemblies for fuel cells)

IT Fuel cell electrodes
 Fuel cell electrolytes
 Fuel cells
 Hybrid organic-inorganic materials
 (manufacture of hybrid organic-inorg. proton conductors
 forming interpenetrating networks for membrane-electrode
 assemblies for fuel cells)

IT Polysulfones, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP
 (Preparation); USES (Uses)
 (polyether-, sulfonated, chlorided, reaction products with
 ethylamine; manufacture of hybrid organic-inorg. proton
 conductors forming interpenetrating networks for
 membrane-electrode assemblies for fuel cells)

IT Polyketones
 Polysulfones, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP
 (Preparation); USES (Uses)
 (polyether-, sulfonated; manufacture of hybrid organic-inorg.
 proton conductors forming interpenetrating
 networks for membrane-electrode assemblies for fuel

- IT cells)
 - Polyethers, uses
 - RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 - (polyketone-, sulfonated; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
 - Polyethers, uses
 - RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 - (polysulfone-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
 - Polyethers, uses
 - RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 - (polysulfone-, sulfonated; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
 - Ionic conductors
 - (protonic; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
 - 7440-44-0, Carbon, uses
 - RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 - (elec. conductive particles, catalyst supported on; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
 - 75-04-7DP, Ethylamine, reaction product with polyether-polyketone sulfonyl chlorides 78-10-4DP, Tetraethoxysilane, reaction product with phosphoric acid and titanium tetraisopropoxide 546-68-9DP, Titanium tetraisopropoxide, reaction products with phosphoric acid and alkoxy silanes 780-69-8DP, Phenyltriethoxysilane, reaction product with phosphoric acid, titanium tetraisopropoxide, and tetraethoxysilane 7429-90-5DP, Aluminum, alkoxides, reaction products with phosphoric acids and silicon oxide precursors 7440-67-7DP, Zirconium, alkoxides, reaction products with phosphoric acids and silicon oxide precursors 7664-38-2DP, Phosphoric acid, reaction products with titanium tetraisopropoxide and alkoxy silanes 82887-05-6DP, Diethylphosphatoethyltriethoxysilane, reaction product with phosphoric acid, titanium tetraisopropoxide, and tetraethoxysilane 126519-89-9DP, 2-(4-Chlorosulfonylphenyl)ethyltrimethoxysilane, reaction product with phosphoric acid, titanium tetraisopropoxide, and tetraethoxysilane
 - RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 - (manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)

L379 ANSWER 12 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2005:75832 Document No. 142:138384 Hybrid organic-inorganic
 proton conductors, their manufacture, and
 membrane-electrode assemblies and fuel cells
 using them. Matsuo, Kazumine; Omichi, Takahiro (Teijin Ltd.,
 Japan). Jpn. Kokai Tokkyo Koho JP 2005025943 A2 20050127, 29 pp.
 (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-186535 20030630.

AB The proton conductors comprise organic polymer
 proton conductors, and inorg. proton
 conductors comprising condensates of 100 mol parts solid

acids, 450-20,000 mol parts Lewis acidic metal alkoxides, and Si oxide precursors, e.g., alkoxy silanes, where the organic and inorg. proton conductors form interpenetrating networks. In the manufacture, the solid acids were hydrolyzed and condensed with the alkoxides and the precursors in solvents, added to organic polymer proton conductor solns., and cast into films. The assemblies have the proton conductors sandwiched between catalyst electrodes containing metals supported on fine elec. conductive particles. The proton conductors show good flexibility, and oxidation and swelling resistance, resulting in fuel cells showing good dimensional stability.

IC ICM H01M008-02
 ICS H01B001-06; H01B013-00; H01M004-86; H01M004-88; H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 76

ST hybrid org inorg proton conductor
 interpenetrating network fuel cell; solid acid condensate electrolyte fuel cell;
 Lewis acid metal alkoxide condensate electrolyte fuel cell; alkoxy silane condensate electrolyte fuel cell

IT Metal alkoxides
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (Lewis acidic, condensates with solid acids and silicon oxide precursors; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)

IT Fuel cell electrodes
 Fuel cell electrolytes
 Fuel cells
 Hybrid organic-inorganic materials
 (manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)

IT Heteropoly acids
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (molybdophosphoric, reaction products with Lewis acidic metal alkoxides, and silicon oxide precursors; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)

IT Polysulfones, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (polyether-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)

IT Polyketones
 Polysulfones, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (polyether-, sulfonated; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)

IT Polyethers, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (polyketone-, sulfonated; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)

- IT Polyethers, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (polysulfone-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
- IT Polyethers, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (polysulfone-, sulfonated; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
- IT Ionic conductors
 (protonic; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
- IT Heteropoly acids
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (tungstophosphoric, reaction products with titanium tetraisopropoxide and alkoxy silanes; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
- IT Heteropoly acids
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (tungstosilicic, reaction products with tungstophosphoric acid, titanium tetraisopropoxide and alkoxy silanes; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
- IT 7440-44-0, Carbon, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (elec. conductive particles, catalyst supported on; manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)
- IT 75-04-7DP, Ethylamine, reaction product with polyether-polyketone sulfonyl chlorides 78-10-4DP, Tetraethoxysilane, reaction products with solid acids and titanium tetraisopropoxide
 546-68-9DP, Titanium tetraisopropoxide, reaction products with solid acids and alkoxy silanes 780-69-8DP,
 Phenyltriethoxysilane, reaction product with tungstophosphoric acid, titanium tetraisopropoxide, and tetraethoxysilane
 7429-90-5DP, Aluminum, alkoxides, reaction products with solid acids and silicon oxide precursors 7440-67-7DP, Zirconium, alkoxides, reaction products with solid acids and silicon oxide precursors
 7664-38-2DP, Phosphoric acid, reaction products with solid acids, titanium tetraisopropoxide, and tetraethoxysilane
 11104-88-4DP, Molybdochosphoric acid, reaction product with Lewis acidic metal alkoxides, and silicon oxide precursors
 12067-99-1DP, Tungstophosphoric acid, reaction products with titanium tetraisopropoxide and alkoxy silanes 13598-36-2DP,
 Phosphonic acid, reaction product with heteropoly acids, Lewis acidic metal alkoxides, and silicon oxide precursors
 82887-05-6DP, Diethylphosphatoethyltriethoxysilane, reaction product with tungstophosphoric acid, titanium tetraisopropoxide, and tetraethoxysilane 126519-89-9DP, 2-(4-Chlorosulfonylphenyl)ethyltrimethoxysilane, reaction product with tungstophosphoric acid, titanium tetraisopropoxide, and tetraethoxysilane 827036-43-1DP, Silicon tungsten hydroxide oxide, reaction products with tungstophosphoric acid, titanium tetraisopropoxide, and alkoxy silanes

RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (manufacture of hybrid organic-inorg. proton conductors forming interpenetrating networks for membrane-electrode assemblies for fuel cells)

L379 ANSWER 13 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2005:16056 Document No. 142:117647 Fuel cells and their components using catalysts having a high metal to support ratio. Kourtakis, Kostantinos (E. I. du Pont de Nemours and Company, USA). PCT Int. Appl. WO 2005001978 A2 20050106, 36 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-US16707 20040527. PRIORITY: US 2003-PV475075 20030530.

AB The present invention relates to coated substrates comprising electrocatalysts containing at least about 70 weight% of a metal. The present invention also relates to fuel cell stacks and single cells, including direct methanol fuels cells, hydrogen fuel cells, and reformed hydrogen fuel cells comprising the coated substrate comprising electrocatalysts containing at least about 70 weight% of a metal.
 IT 7440-05-3, Palladium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (fuel cells and their components using catalysts having high metal to support ratio)
 RN 7440-05-3 HCPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST fuel cell catalyst high metal support ratio
 IT Carbides
 Oxides (inorganic), uses
 RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)
 (composites; fuel cells and their components using catalysts having high metal to support ratio)
 IT Fuel cells
 (direct methanol; fuel cells and their components using catalysts having high metal to support ratio)
 IT Catalysts
 (electrocatalysts; fuel cells and their components using catalysts having high metal to support ratio)
 IT Carbon fibers, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (fabrics; fuel cells and their components using catalysts having high metal to support ratio)
 IT Conducting polymers
 Fuel cells

(fuel cells and their components using catalysts having high metal to support ratio)

IT Transition metal carbides
 RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)
 (fuel cells and their components using catalysts having high metal to support ratio)

IT Polymers, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (ion-exchange; fuel cells and their components using catalysts having high metal to support ratio)

IT Metalloporphyrins
 RL: CAT (Catalyst use); USES (Uses)
 (iron; fuel cells and their components using catalysts having high metal to support ratio)

IT Metalloporphyrins
 RL: CAT (Catalyst use); USES (Uses)
 (nickel; fuel cells and their components using catalysts having high metal to support ratio)

IT Carbon fibers, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (paper; fuel cells and their components using catalysts having high metal to support ratio)

IT Sulfonic acids, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (perfluoro; fuel cells and their components using catalysts having high metal to support ratio)

IT Perfluoro compounds
 RL: TEM (Technical or engineered material use); USES (Uses)
 (sulfonic acids; fuel cells and their components using catalysts having high metal to support ratio)

IT Ion exchange membranes
 (support; fuel cells and their components using catalysts having high metal to support ratio)

IT 132-16-1, Iron phthalocyanine 3317-67-7, Cobalt phthalocyanine 7439-98-7, Molybdenum, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-33-7, Tungsten, uses 12779-05-4 14055-02-8, Nickel phthalocyanine 15612-49-4, Cobalt porphyrin
 RL: CAT (Catalyst use); USES (Uses)
 (fuel cells and their components using catalysts having high metal to support ratio)

IT 7440-44-0, Carbon, uses
 RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)
 (fuel cells and their components using catalysts having high metal to support ratio)

L379 ANSWER 14 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:1036049 Document No. 142:25858 Direct-type polymer electrolyte fuel cell with anode containing oxidation catalyst. Yanase, Takanori; Iwasaki, Fumiharu; Tamachi, Tsuneaki; Sarada, Takashi; Furuta, Kazuyoshi (Seiko Instruments, Inc., Japan). Jpn. Kokai Tokkyo Koho JP 2004342435 A2 20041202, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-136905 20030515.

AB The claimed fuel cell is equipped with an anode containing an electrochem. oxidation catalyst for a metal complex hydride fuel, where the catalyst decomp. the fuel to give a

cation and oxidizes a byproduct H gas to give H₂O. The anode catalyst may contain (1) Co and/or a H-absorbing alloy and Ni, Pd, and/or Pt or (2) C-supported Ni, Pd, and/or Pt. The fuel cell provides suppressed generation of H gas reaction products and improved handling property of fuels, e.g., NaBH₄.

IT 7440-02-0, Nickel, uses 7440-05-3,
 Palladium, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (catalyst; anode catalyst for direct borohydride polymer
 electrolyte fuel cell)

RN 7440-02-0 HCPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-90
 ICS H01M004-86; H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 67
 ST anode oxidn catalyst direct borohydride polymer electrolyte
 fuel cell
 IT Fuel cell anodes
 Oxidation catalysts
 (anode catalyst for direct borohydride polymer
 electrolyte fuel cell)
 IT Fuel cells
 (polymer electrolyte; anode catalyst for direct
 borohydride polymer electrolyte fuel
 cell)
 IT 16940-66-2, Sodium tetrahydroborate
 RL: TEM (Technical or engineered material use); USES (Uses)
 (anode catalyst for direct borohydride polymer
 electrolyte fuel cell)
 IT 7440-02-0, Nickel, uses 7440-05-3,
 Palladium, uses 7440-06-4, Platinum, uses 7440-48-4,
 Cobalt, uses 799854-37-8
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (catalyst; anode catalyst for direct borohydride polymer
 electrolyte fuel cell)

L379 ANSWER 15 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2004:1020207 Document No. 142:9228 Solid oxide fuel
 cell and method for producing same. Shibutani, Satoshi;
 Okada, Yukihiro; Yuasa, Kohji; Taniguchi, Noboru; Mino, Norihisa;
 Niikura, Junji (Matsushita Electric Industrial Co., Ltd., Japan).
 PCT Int. Appl. WO 2004102704 A1 20041125, 53 pp. DESIGNATED STATES:
 W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH,
 CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,
 GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
 LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM,
 PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR,
 TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ,
 CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU,
 MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (Japanese). CODEN:
 PIXXD2. APPLICATION: WO 2004-JP6772 20040513. PRIORITY: JP
 2003-136344 20030514.

AB A solid oxide fuel cell is disclosed which is excellent in electricity generation characteristics even at lower temps. (for example, in the range from 200°C to 600°C, preferably in the range from 400°C to 600°C). A method for producing such a solid oxide fuel cell is also disclosed. The solid oxide fuel cell comprises an anode, a cathode, and a first solid oxide which is held between the anode and the cathode. The anode contains a metal particle (2), an anode catalyst (1) and an ion conductor (3), and the anode catalyst (1) is adhered to the surface of the metal particle (2). The first solid oxide and the ion conductor (3) resp. have an ion conductivity selected from oxide-ion conductivity and hydrogen-ion conductivity

IT 7440-02-0, Nickel, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst support for metal catalysts for fuel cells)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IT 386720-65-6, Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3)
 RL: TEM (Technical or engineered material use); USES (Uses)
 (ion conductors for fuel cells)

RN 386720-65-6 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1
Ba	1	7440-39-3

IT 7440-05-3, Palladium, uses 7440-22-4, Silver, uses
 RL: CAT (Catalyst use); USES (Uses)
 (nickel supported catalysts for fuel cells)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
 CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM H01M004-86
 ICS H01M004-88; H01M008-02; H01M008-12
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST ion conductive metal oxide fuel
cell anode catalyst

IT Ionic conductors
(solid oxide fuel cells containing metal
oxide type)

IT Catalysts
(solid oxide fuel cells containing metal
-supported)

IT Fuel cells
(solid oxide; metal oxide ion
conductors and catalysts form)

IT 7440-02-0, Nickel, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst support for metal catalysts for
fuel cells)

IT 162105-72-8, Cerium samarium oxide (Ce0.8Sm0.2O2) 183546-68-1,
Cerium gadolinium oxide (Ce0.9Gd0.1O2) 258347-94-3, Cerium
lanthanum oxide (Ce0.9La0.1O2) 386720-65-6, Barium
cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3)
797816-90-1
RL: TEM (Technical or engineered material use); USES (Uses)
(ion conductors for fuel
cells)

IT 7439-88-5, Iridium, uses 7439-89-6, Iron, uses
7440-05-3, Palladium, uses 7440-06-4, Platinum,
uses 7440-16-6, Rhodium, uses 7440-22-4, Silver
, uses 7440-48-4, Cobalt, uses 7440-57-5, Gold, uses
12714-36-2 37365-43-8 39361-20-1 77491-76-0 252010-68-7
RL: CAT (Catalyst use); USES (Uses)
(nickel supported catalysts for fuel
cells)

L379 ANSWER 16 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:965172 Document No. 141:368468 Manufacture of metal
hydrides and their use for hydrogen storage in fuel cells.
Edwards, Peter Philip; Grochala, Wojciech; Book, David; Harris, Ivor
Rex (Isis Innovation Limited, UK). PCT Int. Appl. WO 2004096700 A1
20041111, 21 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ,
BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,
JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,
MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD,
SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN,
YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK,
ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN,
TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-GB1579
20040413. PRIORITY: GB 2003-8253 20030410.

AB Metal hydrides are produced by mech. grinding or
milling an oxide or halide of a 1st metal with a
hydride of a 2nd metal, especially NaH, NaBH4, or
LiAlH4. The reacting particles have a particle size of ≤ 50
 μm , preferably 5-40 μm .
The produced metal hydride can be used for
hydrogen storage to supply hydrogen fuel to fuel
cells, especially polymeric-electrolyte-membrane or alkaline
fuel cells. An elec. energy generating system
consists of a hydrogen fuel cell having an inlet
for hydrogen gas; and a storage vessel containing the solid
metal hydride material being connected to the
inlet of the hydrogen fuel cell, wherein the
solid metal hydride material thermally decomp.
to release hydrogen gas at a temperature within the operating
range of the hydrogen fuel cell
(60-120°). The hydrogen storage material can be Zn(BH4)2,
NaBH4, MgH2, and/or AlH3.

IC ICM C01B006-00

ICS C01B006-21; H01M008-06; B60L011-18
 CC 52-3 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST metal hydride zinc borohydride manuf hydrogen
 storage fuel cell
 IT Fuel cells
 (alkaline fuel cells; manufacture of metal hydrides
 and their use for hydrogen storage in fuel cells)
 IT Ball milling
 (manufacture of metal hydrides and their use for
 hydrogen storage in fuel cells)
 IT Fuel cells
 (polymer electrolyte; manufacture of metal
 hydrides and their use for hydrogen storage in
 fuel cells)
 IT 17611-70-0P, Zinc borohydride
 RL: CPS (Chemical process); IMF (Industrial manufacture); NUU (Other
 use, unclassified); PEP (Physical, engineering or chemical process);
 PREP (Preparation); PROC (Process); USES (Uses)
 (manufacture of metal hydrides and their use for
 hydrogen storage in fuel cells)
 IT 7693-27-8, Magnesium hydride (MgH₂) 7784-21-6, Aluminum
 hydride (AlH₃)
 RL: CPS (Chemical process); NUU (Other use, unclassified); PEP
 (Physical, engineering or chemical process); PROC (Process); USES
 (Uses)
 (manufacture of metal hydrides and their use for
 hydrogen storage in fuel cells)
 IT 1314-13-2, Zinc oxide, reactions 7646-85-7, Zinc chloride,
 reactions 16940-66-2, Sodium borohydride
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
 (manufacture of metal hydrides and their use for
 hydrogen storage in fuel cells)

L379 ANSWER 17 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:934657 Document No. 141:398175 Metal-supported

porous carbon films as fuel cell
 electrodes. Ohya, Shyusei; Fujii, Yuuichi; Matsuo, Makoto; Takagi,
 Jun (Ube Industries, Ltd., Japan). PCT Int. Appl. WO 2004095614 A2
 20041104, 27 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ,
 BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM,
 DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,
 KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,
 MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE,
 SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU,
 ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES,
 FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD,
 TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-JP5092
 20040408. PRIORITY: JP 2003-113978 20030418.

AB The invention concerns a metal-supported porous
 carbon film wherein metal fine particles with a
 mean particle diameter of 0.7-20 nm are dispersed and supported
 on pore surface walls, fuel cell
 electrodes employing the metal-supported porous
 carbon film, a membrane-electrode assembly comprising the
 fuel cell electrodes bonded on both sides
 of a polymer electrolyte film, and a
 fuel cell comprising the fuel
 cell electrode as a constituent element. The
 support structure is such that metal fine
 particles having a controlled particle size are uniformly
 supported to allow effective utilization of the
 metal-based catalyst, and the fabrication steps are simple.

IT 7440-05-3, Palladium, uses 7440-05-3D,

Palladium, compound

RL: CAT (Catalyst use); USES (Uses)

(metal-supported porous carbon films
as fuel cell electrodes)
RN 7440-05-3 HCPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-05-3 HCPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-88
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST fuel cell electrode metal
supported porous carbon film
IT Polyimides, uses
RL: DEV (Device component use); USES (Uses)
(carbonized product; metal-supported porous
carbon films as fuel cell
electrodes)
IT Polyoxyalkylenes, uses
RL: MOA (Modifier or additive use); USES (Uses)
(fluorine- and sulfo-containing, ionomers; metal-
supported porous carbon films as fuel
cell electrodes)
IT Fuel cell electrodes
(metal-supported porous carbon films
as fuel cell electrodes)
IT Metals, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(metal-supported porous carbon films
as fuel cell electrodes)
IT Fluoropolymers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers;
metal-supported porous carbon films
as fuel cell electrodes)
IT Ionomers
RL: MOA (Modifier or additive use); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing; metal-
supported porous carbon films as fuel
cell electrodes)
IT 7440-05-3, Palladium, uses 7440-05-3D,
Palladium, compound
RL: CAT (Catalyst use); USES (Uses)
(metal-supported porous carbon films
as fuel cell electrodes)
IT 7440-06-4, Platinum, uses 7440-44-0, Carbon, uses
RL: DEV (Device component use); USES (Uses)
(metal-supported porous carbon films
as fuel cell electrodes)
IT 785808-93-7, Nafion 11
RL: MOA (Modifier or additive use); USES (Uses)
(metal-supported porous carbon films
as fuel cell electrodes)
IT 785785-69-5, TPX 205MU 785785-70-8, TPX 205R
RL: TEM (Technical or engineered material use); USES (Uses)
(metal-supported porous carbon films
as fuel cell electrodes)
IT 7782-42-5, Graphite, uses

RL: TEM (Technical or engineered material use); USES (Uses)
 (support; metal-supported porous
 carbon films as fuel cell
 electrodes)

L379 ANSWER 18 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2004:898951 Document No. 141:368429 Unit cell structure for
 fuel cell, and its use in solid oxide fuel
 cell. Hara, Naoki; Takeuchi, Kazushi; Shibata, Itaru
 (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP
 2004303508 A2 20041028, 16 pp. (Japanese). CODEN: JKXXAF.
 APPLICATION: JP 2003-93400 20030331.

AB The unit cell structure has a **metal sheet**
 sandwiched between 2 unit cells. The unit cell has battery
 components or an **electrolyte layer** and an anode
 or cathode **layer** on upper side of a
metal support having (1) ≥ 1 pore with
 opening at upper and lower **sides** or (2) ≥ 1
 depressed section at lower **side** and pores at the depressed
 section bottom. The same kind electrode **layers** (i.e.,
 anode to anode, cathode to cathode) of the 2 unit cells are
 faced through the **metal sheet**, and the
 sheet has ≥ 1 hole penetrating through upper and lower
sides. Preferably, the **metal support**
 contains **Fe, Ni, and/or Cu**. The
 fuel cell has a stack of the unit cell structure,
 wherein an insulating part is placed at the **metal**
support and/or the **metal sheet**, and each
 unit cell structure has current collectors at the **anode side**
 and the **cathode side**. The unit cell structure with high
 reliability of the same electrode faced part gives a
 small-sized lightwt. **fuel cell**.

IT 7440-02-0, Nickel, uses 7440-50-8,

Copper, uses

RL: DEV (Device component use); USES (Uses)
 (support containing; unit cell structure with **metal**
 sheet sandwiched between two unit cells on **metal**
supports for solid oxide fuel cell)

RN 7440-02-0 HCPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-50-8 HCPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT 7440-22-4, Silver, uses

RL: DEV (Device component use); USES (Uses)
 (support; unit cell structure with **metal**
 sheet sandwiched between two unit cells on **metal**
supports for solid oxide fuel cell)

RN 7440-22-4 HCPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM H01M008-02

ICS H01M008-12; H01M008-24

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST solid oxide fuel cell unit cell
 structure; metal support sheet unit
 cell structure fuel cell
 IT Electric insulators
 (ceramic, fuel cell component; unit cell
 structure with metal sheet sandwiched between
 two unit cells on metal supports for solid
 oxide fuel cell)
 IT Fuel cells
 (solid oxide; unit cell structure with metal
 sheet sandwiched between two unit cells on metal
 supports for solid oxide fuel cell)
 IT 11109-52-7, SUS 430 39323-81-4, Invar
 RL: DEV (Device component use); USES (Uses)
 (sheet, current collector; unit cell structure with
 metal sheet sandwiched between two unit cells
 on metal supports for solid oxide
 fuel cell)
 IT 12606-02-9, Inconel 39362-79-3, 42 Alloy
 RL: DEV (Device component use); USES (Uses)
 (sheet, support; unit cell structure with
 metal sheet sandwiched between two unit cells
 on metal supports for solid oxide
 fuel cell)
 IT 7439-89-6, Iron, uses 7440-02-0, Nickel
 , uses 7440-50-8, Copper, uses
 RL: DEV (Device component use); USES (Uses)
 (support containing; unit cell structure with metal
 sheet sandwiched between two unit cells on metal
 supports for solid oxide fuel cell)
 IT 7440-22-4, Silver, uses
 RL: DEV (Device component use); USES (Uses)
 (support; unit cell structure with metal
 sheet sandwiched between two unit cells on metal
 supports for solid oxide fuel cell)

L379 ANSWER 19 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:820264 Document No. 141:317228 Fuel cell
 units and their manufacture. Takeuchi, Kazushi; Hara, Naoki;
 Shibata, Itaru (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo
 Koho JP 2004281172 A2 20041007, 14 pp. (Japanese). CODEN: JKXXAF.
 APPLICATION: JP 2003-69480 20030314.

AB The fuel cell units have an electrolyte
 and an anode layer or a cathode layer on a
 metal support, where the metal
 support has a recessed area of any pattern on the opposite
 side from the electrolyte layer, a
 porous area at the bottom of the recessed area, and a porous gas
 permeable reinforcing member at the bottom of the recessed area,.
 The support is a metal containing Fe,
 Ni, Cu, Cr, Mo, and/or W. The units are
 prepared by forming the electrolyte layer and the
 electrode layer successively on the metal
 support, forming the recessed area on the backside of the
 support, making the bottom part of the recessed area porous,
 and adding the gas permeable reinforcing member to the bottom.

IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); PEP (Physical, engineering or
 chemical process); PYP (Physical process); PROC (Process); USES
 (Uses)
 (structure and manufacture of fuel cell units
 containing metal supports having recessed areas
 with porous bottoms and gas permeable reinforcing members)

RN 7440-02-0 HCAPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M004-86
 ICS H01M004-88; H01M008-02; H01M008-12
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST fuel cell metal separator structure
 manuf
 IT Fuel cells
 (structure and manufacture of fuel cell units
 containing metal supports having recessed areas
 with porous bottoms and gas permeable reinforcing members)
 IT 1344-28-1, Alumina, uses 7440-02-0, Nickel, uses
 7440-18-8, Ruthenium, uses 12605-84-4, Hastelloy B 12606-02-9,
 Inconel 39362-79-3, 42 Alloy 113482-02-3, Yttrium
 zirconium oxide (Y_{0.06}Zr_{0.97}O₂.03) 114168-16-0, Yttrium zirconium
 oxide (Y_{0.16}Zr_{0.92}O₂.08)
 RL: DEV (Device component use); PEP (Physical, engineering or
 chemical process); PYP (Physical process); PROC (Process); USES
 (Uses)
 (structure and manufacture of fuel cell units
 containing metal supports having recessed areas
 with porous bottoms and gas permeable reinforcing members)

L379 ANSWER 20 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:803048 Document No. 141:317212 Fuel cell.

Taniguchi, Noboru (Matsushita Electric Industrial Co., Ltd., Japan).
 PCT Int. Appl. WO 2004084332 A1 20040930, 45 pp. DESIGNATED
 STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,
 CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB,
 GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
 LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO,
 NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
 TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE,
 BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE,
 IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (Japanese).
 CODEN: PIXXD2. APPLICATION: WO 2004-JP3392 20040315. PRIORITY: JP
 2003-72702 20030317.

AB The fuel cell comprises an electrolyte
 between an anode and a cathode, a fuel supply part supplying a fuel
 to the anode, an oxidizing agent supply part supplying an O containing
 oxidizing agent to the cathode, and a heating part heating the
 fuel cell; where the electrolyte is made
 of a solid oxide; and the fuel is liquid or solid at ordinary
 temperature and normal pressure.

IT 386720-65-6D, Barium cerium gadolinium zirconium oxide
 (BaCe_{0.2}Gd_{0.2}Zr_{0.6}O₃), O deficient 632286-96-5D, Barium
 cerium gadolinium zirconium oxide (BaCe_{0.24}Gd_{0.24}Zr_{0.52}O₃), O
 deficient 632286-97-6D, Barium cerium gadolinium zirconium
 oxide (BaCe_{0.24}Gd_{0.2}Zr_{0.56}O₃), O deficient
 RL: DEV (Device component use); USES (Uses)
 (fuel cells containing heating means and solid
 oxides in electrolytes)

RN 386720-65-6 HCAPLUS
 CN Barium cerium gadolinium zirconium oxide (BaCe_{0.2}Gd_{0.2}Zr_{0.6}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1

Ba	1	7440-39-3
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RN 632286-96-5 HCPLUS
 CN Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.24}\text{Zr}_{0.52}\text{O}_3$)
 (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.52	7440-67-7
Gd	0.24	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632286-97-6 HCPLUS
 CN Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.22}\text{Zr}_{0.56}\text{O}_3$)
 (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.56	7440-67-7
Gd	0.2	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

IC ICM H01M008-02
 ICS H01M008-04; H01M008-06; H01M008-12
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST fuel cell structure heating means
 electrolyte solid oxide
 IT Fuel cell electrolytes
 Fuel cells
 (fuel cells containing heating means and solid
 oxides in electrolytes)
 IT 7440-06-4, Platinum, uses
 RL: CAT (Catalyst use); USES (Uses)
 (fuel cells containing heating means and solid
 oxides in electrolytes)
 IT 64-17-5, Ethanol, uses 67-56-1, Methanol, uses 71-23-8, Propyl
 alcohol, uses 71-36-3, Butyl alcohol, uses 106-97-8, Butane,
 uses 144378-46-1D, Barium cerium gadolinium oxide
 $(\text{BaCe}_{0.8}\text{Gd}_{0.2}\text{O}_3)$, O deficient 288865-89-4D, Barium cerium yttrium
 zirconium oxide ($\text{BaCe}_{0.4}\text{Y}_{0.2}\text{Zr}_{0.4}\text{O}_3$), O deficient 288866-24-0D,
 Barium cerium indium zirconium oxide ($\text{BaCe}_{0.4}\text{In}_{0.2}\text{Zr}_{0.4}\text{O}_3$), O
 deficient 288866-28-4D, Barium cerium indium zirconium oxide
 $(\text{BaCe}_{0.5}\text{In}_{0.2}\text{Zr}_{0.3}\text{O}_3)$, O deficient 386720-65-6D, Barium
 cerium gadolinium zirconium oxide ($\text{BaCe}_{0.2}\text{Gd}_{0.2}\text{Zr}_{0.6}\text{O}_3$), O deficient
 632286-92-1D, Barium cerium ytterbium zirconium oxide
 $(\text{BaCe}_{0.4}\text{Yb}_{0.2}\text{Zr}_{0.4}\text{O}_3)$, O deficient 632286-93-2, Aluminum barium
 cerium gadolinium oxide ($\text{Al}_{0.02}\text{BaCe}_{0.8}\text{Gd}_{0.2}\text{O}_3$) 632286-94-3D,
 Aluminum barium cerium indium zirconium oxide
 $(\text{Al}_{0.02}\text{BaCe}_{0.4}\text{In}_{0.2}\text{Zr}_{0.4}\text{O}_3)$, O deficient 632286-96-5D,
 Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.24}\text{Zr}_{0.52}\text{O}_3$), O
 deficient 632286-97-6D, Barium cerium gadolinium zirconium
 oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.22}\text{Zr}_{0.56}\text{O}_3$), O deficient 632286-98-7D, O
 deficient 767287-96-7D, O deficient
 RL: DEV (Device component use); USES (Uses)
 (fuel cells containing heating means and solid
 oxides in electrolytes)

L379 ANSWER 21 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2004:788704 Document No. 142:184185 Process for preparation of
 supported platinum and Pt-based multi-element catalyst

organic sol. Tang, Yawen; Lu, Tianhong; Yang, Hui (Nanjing Normal University, Peop. Rep. China). Faming Zhuanli Shengqing Gongkai Shuomingshu CN 1410160 A 20030416, 7 pp. (Chinese). CODEN: CNXXEV. APPLICATION: CN 2002-138658 20021126.

AB The title process comprises the following steps of (1) dissolving Pt and Pt-based multi-element salt or acid compound into organic solvent, adding organic solution of SnCl₂ under stirring, allowing to react for 5 min to obtain organic sol of the metal salt ; (2) adding support to the component A at -25-65°C, allowing to react under N₂ protection; and (3) washing with NaOH or Na₂CO₃ solution, acid and water till no Cl ion is detectable, and drying at 60-150°C to obtain the catalyst. The other metal is from Ru, Ir, Rh or Os; and the support from activated carbon, carbon black or mol. sieve. This catalyst is used in proton-exchange membrane fuel cell.

IT 7772-99-8, Tin dichloride, uses
 RL: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent);
 USES (Uses)
 (preparation of supported platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

RN 7772-99-8 HCAPLUS
 CN Tin chloride (SnCl₂) (8CI, 9CI) (CA INDEX NAME)

Cl—Sn—Cl

IC ICM B01J023-42
 ICS B01J037-02

CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
 Section cross-reference(s): 52

IT Redox reaction catalysts
 (preparation of supported platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT Carbon black, uses
 RL: CAT (Catalyst use); USES (Uses)
 (preparation of supported platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT Fuel cells
 (proton exchange membrane; preparation of supported platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT 7440-44-0, Activated carbon, uses
 RL: CAT (Catalyst use); USES (Uses)
 (activated; preparation of supported platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT 7439-88-5, Iridium, uses 7440-04-2, Osmium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (preparation of supported platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

IT 7772-99-8, Tin dichloride, uses 16941-12-1, Chloroplatinic acid
 RL: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent);
 USES (Uses)
 (preparation of supported platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

L379 ANSWER 22 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:584211 Document No. 141:413488 Metal-supported

solid oxide fuel cells for operation at
temperatures of 500-650.degree.C.

Atkinson, A.; Baron, S.; Brandon, N. P.; Esquirol, A.; Kilner, J. A.; Oishi, N.; Rudkin, R.; Steele, B. C. H. (Centre for Ion Conducting Membranes, Imperial College London, SW7 2BP, UK). Fuel Cell Science, Engineering and Technology, International Conference on Fuel Cell Science, Engineering and Technology, 1st, Rochester, NY, United States, Apr. 21-23, 2003, Meeting Date 2003, 499-506. Editor(s): Shah, Ramesh K.; Kandlikar, S. G. American Society of Mechanical Engineers: New York, N. Y. ISBN: 0-7918-3668-1 (English) 2003. CODEN: 69FQKI.

AB Innovative intermediate temperature solid oxide fuel cells were developed which involved the fabrication of a thick-film PEN structure supported on a ferritic stainless steel substrate. Use of a metal support enables a robust structure to be fabricated which can withstand stresses during operation. It is possible to arrange a processing schedule that allows the deposited electrolyte powder to be sintered into an impermeable thick film (10-20 .mu.m) at .apprx.1000°. This relatively low sintering temperature is compatible with the mech. integrity of the stainless steel support. An anode film is initially deposited on the metal support followed by deposition of the electrolyte powder. Much of the initial development work was carried out using ceria-based electrolytes. The cell is completed by depositing a cathode. Results are presented on the development and characterization of anode and cathode materials with a discussion on cell development.

IT 7440-02-0, Nickel, uses

RL: DEV (Device component use); USES (Uses)
(composite material containing cerium gadolinium oxide and; stainless steel-supported SOFCs for operation at 500-650°)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST stainless steel support solid oxide fuel cell

IT Fuel cells

(solid oxide; stainless steel-supported SOFCs for operation at 500-650°)

IT 61162-99-0, Cobalt iron lanthanum strontium oxide

RL: DEV (Device component use); USES (Uses)
(cathode; in stainless steel-supported SOFCs for operation at 500-650°)

IT 152233-89-1, Cerium gadolinium oxide (Ce0.9Gd0.1O1.95)

RL: DEV (Device component use); USES (Uses)
(composite material containing Ni and; in stainless steel-supported SOFCs for operation at 500-650°)

IT 7440-02-0, Nickel, uses

RL: DEV (Device component use); USES (Uses)
(composite material containing cerium gadolinium oxide and; stainless steel-supported SOFCs for operation at 500-650°)

IT 152233-89-1D, Cerium gadolinium oxide (Ce0.9Gd0.1O1.95),

oxygen-deficient
 RL: DEV (Device component use); USES (Uses)
 (electrolyte; in stainless steel-supported
 SOFCs for operation at 500-650°)
 IT 12597-68-1, Stainless steel, uses
 RL: DEV (Device component use); USES (Uses)
 (ferritic; stainless steel-supported SOFCs
 for operation at 500-650°)

L379 ANSWER 23 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:552141 Document No. 141:74332 Compact fuel cell having system for
 dehydrogenation of organic hydrides inside for efficient
 power generation. Ichikawa, Masaru; Sasazu, Hiroshi; Suzuki,
 Fumihiro (Electric Power Development Co., Ltd., Japan). Jpn. Kokai
 Tokkyo Koho JP 2004192834 A2 20040708, 11 pp. (Japanese). CODEN:
 JKXXAF. APPLICATION: JP 2002-356074 20021206.
 AB The fuel cell consists of a cathode reactor
 filled with an oxidizing agent, an anode reactor having a holder for
 organic hydrides, a dehydrogenation catalyst, and a heater,
 sealed with a H separator membrane, and an ion-exchange
 membrane between a cathode current collector and an anode current
 collector, each having a Pt catalyst, wherein H ion is
 formed by dehydrogenation of organic hydrides, separation of the
 resulting H with the H separator membrane, and ionization
 of the H in contact with the Pt catalyst supported on the
 anode current collector, and passed through the ion
 -exchange membrane for reaction with O ion in the cathode
 reactor.
 IT 7439-89-6, Iron, uses 7440-02-0,
 Nickel, uses 7440-05-3, Palladium, uses
 7440-47-3, Chromium, uses 7440-50-8,
 Copper, uses 7440-62-2, Vanadium, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (compact fuel cell having system for dehydrogenation of organic
 hydrides inside)
 RN 7439-89-6 HCAPLUS
 CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-47-3 HCAPLUS
 CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS
 CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCAPLUS
 CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM H01M008-04
 ICS H01M008-06; H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST fuel cell org **hydride** dehydrogenation catalyst hydrogen;
 isopropanol hydrogenation oxygen fuel cell platinum catalyst
 IT Carbon fibers, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (activated; compact fuel cell having system for dehydrogenation
 of organic **hydrides** inside)
 IT Polymers, uses
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); TEM (Technical or engineered material use); PROC
 (Process); USES (Uses)
 (aromatic, hydrogenated; compact fuel cell having system for
 dehydrogenation of organic **hydrides** inside)
 IT Nanotubes
 (carbon; compact fuel cell having system for dehydrogenation of
 organic **hydrides** inside)
 IT Catalyst supports
 Dehydrogenation catalysts
 Fuel cells
 Heaters
 (compact fuel cell having system for dehydrogenation of organic
hydrides inside)
 IT Fullerenes
 Zeolites (synthetic), uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (compact fuel cell having system for dehydrogenation of organic
hydrides inside)
 IT Aromatic compounds
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); TEM (Technical or engineered material use); PROC
 (Process); USES (Uses)
 (hydrogenated; compact fuel cell having system for
 dehydrogenation of organic **hydrides** inside)
 IT Porous materials
 (mesoporous; compact fuel cell having system for
 dehydrogenation of organic **hydrides** inside)
 IT Hydrides
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); TEM (Technical or engineered material use); PROC
 (Process); USES (Uses)
 (organic; compact fuel cell having system for dehydrogenation of
 organic **hydrides** inside)
 IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 7439-88-5,
 Iridium, uses 7439-89-6, Iron, uses 7439-98-7,
 Molybdenum, uses 7440-02-0, Nickel, uses
 7440-05-3, Palladium, uses 7440-06-4, Platinum,
 uses 7440-15-5, Rhenium, uses 7440-16-6, Rhodium, uses
 7440-18-8, Ruthenium, uses 7440-33-7, Tungsten, uses
 7440-47-3, Chromium, uses 7440-48-4, Cobalt,
 uses 7440-50-8, Copper, uses 7440-62-2
 , Vanadium, uses 7631-86-9, Silica, uses 13463-67-7,
 Titania, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)

- (compact fuel cell having system for dehydrogenation of organic hydrides inside)
- IT 1333-74-0P, Hydrogen, preparation
 RL: CPS (Chemical process); IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
 (compact fuel cell having system for dehydrogenation of organic hydrides inside)
- IT 64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses 71-36-3, Butyl alcohol, uses 7722-84-1, Hydrogen peroxide, uses 7782-44-7, Oxygen, uses
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (compact fuel cell having system for dehydrogenation of organic hydrides inside)
- IT 7440-44-0, Carbon, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (nanotubes; compact fuel cell having system for dehydrogenation of organic hydrides inside)

L379 ANSWER 24 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:545609 Document No. 142:338902 Characteristics of anode-supported flat tubular solid oxide fuel cell. Kim, Jong-Hee; Song, Rak-Hyun (Hydrogen Fuel Cells Research Department, Korea Institute of Energy Research, Daejeon, 305-343, S. Korea). Journal of the Korean Electrochemical Society, 7(2), 94-99 (Korean) 2004. CODEN: JKESFC. ISSN: 1229-1935. Publisher: Korean Electrochemical Society.

AB Anode-supported flat tubular solid oxide fuel cells (SOFC) were studied for an increase of the cell power d. The anode-supported flat tube was fabricated by extrusion. The porosity and pore size of Ni/YSZ (8 mol% yttria-stabilized zirconia) cermet anode were 50.6% and 0.23 μm , resp. The Ni particles in the anode were distributed uniformly and connected well to other particles in the cermet anode. The YSZ electrolyte layer and multilayered cathode composed of LSM ((La_{0.85}Sr_{0.15})_{0.9}MnO₃)/YSZ composite, LSM, and LSCF(La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O₃) were coated onto the anode substrate by slurry dip coating. The anode-supported flat tubular cell showed a performance of 300 mW/cm² (0.6 V, 500 mA/cm²) at 800°. The electrochem. characteristics of the flat tubular cell were examined by a.c. impedance and humidified fuel enhanced cell performance. The areal sp. resistance of LSM-coated (slurry dipping) steel, SUS430, as metallic interconnect, was 148 mΩ·cm² at 750° and then decreased to 43 mΩ·cm² after 450 h. However LSM-coated (slurry dipping) Fecralloy had a high area sp. resistance.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST anode supported flat tubular solid state fuel cell
 IT Fuel cells

- (solid electrolyte, tubular; characteristics of anode-supported flat-tubular solid oxide fuel cells)
- IT 185227-83-2
 RL: DEV (Device component use); USES (Uses)
 (anode; characteristics of anode-supported flat-tubular solid oxide fuel cells)
- IT 148595-66-8, Cobalt iron lanthanum strontium oxide (Co_{0.2}Fe_{0.8}La_{0.6}Sr_{0.4}O₃) 149372-30-5, Lanthanum manganese strontium oxide (La_{0.76}MnSr_{0.14}O₃)
 RL: DEV (Device component use); USES (Uses)
 (cathode containing; characteristics of anode-supported flat-tubular solid oxide fuel cells)

- IT 114168-16-0, Yttrium zirconium oxide (Y_{0.16}Zr_{0.92}O₂.08)
 RL: DEV (Device component use); USES (Uses)
 (electrolyte; characteristics of anode-supported flat-tubular solid oxide fuel cells)
- IT 11109-52-7, SUS430 58719-23-6, Fecralloy
 RL: DEV (Device component use); USES (Uses)
 (interconnect; characteristics of anode-supported flat-tubular solid oxide fuel cells)

L379 ANSWER 25 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN

2004:532102 Document No. 141:150136 Nafion based amperometric hydrogen sensor. Velayutham, G.; Ramesh, C.; Murugesan, N.; Manivannan, V.; Dhathathreyan, K. S.; Periaswami, G. (Centre For Electrochemical & Energy Research, SPIC Science Foundation, Chennai, 600 032, India). Ionics, 10(1 & 2), 63-67 (English) 2004. CODEN: IONIFA. ISSN: 0947-7047. Publisher: Institute for Ionics.

AB A Nafion based amperometric H sensor that operates at room temperature was developed. The electrolyte used in the sensor is Nafion 117, which is a proton conducting solid polymer electrolyte. Pd catalyst was used on the sensing side and Pt supported on C on the air side. The sensor functions as fuel cell, H₂/Pd // Nafion // Pt/O₂ and the short circuit current is measured. The short circuit current is linear with respect to concentration of H on the sensing side. The sensor is able to detect the concentration of H in Ar down to ppb level. Details of assembly of the sensor, response behavior and applications are discussed.

CC 79-2 (Inorganic Analytical Chemistry)
 Section cross-reference(s): 72

L379 ANSWER 26 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN

2004:507627 Document No. 141:56590 Hydrogen-permeable alloy membrane, and hydrogen-permeable component and production of same.. Ando, Isao (Sumitomo Metal Mining Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2004174373 A2 20040624, 12 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-343547 20021127.

AB The H-permeable alloy membrane is metal membrane containing face centered cubic crystalline structure Pd or Pd alloy as main composition and B 1-20 atomic%, and it is characterized by having face centered cubic crystalline structure lattice constant (room temperature) ≥ 0.390 nm. The Pd alloy may further contain Cu, Ag and/or Au 0-50 atomic%. The Pd alloy may also contain Y and/or lanthanoid element 0-10 atomic%. The H-permeable component is provided by forming the H-permeable alloy membrane on a gas-permeable porous metal (e.g., SUS316L) support. The production method includes forming the H-permeable alloy membrane on a gas-permeable porous metal support by ion plating, sputtering, applying alloy slurry, electroless plating or electroplating, or alloy rolling, etc. The H-permeable alloy membrane and H-permeable component can be used for purification/separation of H from gas mixture, and the purified/separated H can be used for fuel cells.

IT 7440-05-3, Palladium, properties
 RL: DEV (Device component use); NUU (Other use, unclassified); PRP (Properties); USES (Uses)
 (membrane containing; hydrogen-permeable alloy membrane and hydrogen-permeable component and production of same)

RN 7440-05-3 HCPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM B01D071-02
 ICS B01D053-22; B22F003-11; C01B003-56; C22C001-08; C22C005-04;
 C23C014-14; C23C014-32; C23C014-34; H01M008-06

CC 49-1 (Industrial Inorganic Chemicals)
 Section cross-reference(s) : 52

ST hydrogen permeable alloy membrane; component hydrogen
 permeable prodn; fuel cell hydrogen permeable
 alloy membrane component

IT Membranes, nonbiological
 (alloy, hydrogen-permeable; hydrogen-permeable
 alloy membrane and hydrogen-permeable component and
 production of same)

IT Coating process
 (electroless; hydrogen-permeable alloy membrane and
 hydrogen-permeable component and production of same)

IT Vapor deposition process
 (electron-beam; hydrogen-permeable alloy membrane and
 hydrogen-permeable component and production of same)

IT Crystal structure types
 (face centered cubic, of palladium Pd Ag B;
 hydrogen-permeable alloy membrane and
 hydrogen-permeable component and production of same)

IT Electrodeposition
 Rolling (metals)
 Sputtering
 (hydrogen-permeable alloy membrane and
 hydrogen-permeable component and production of same)

IT Fuel cells
 (hydrogen-permeable alloy membrane and
 hydrogen-permeable component for purification/separation of hydrogen for)

IT Vapor deposition process
 (ion plating; hydrogen-permeable alloy membrane and
 hydrogen-permeable component and production of same)

IT Alloys, properties
 RL: DEV (Device component use); NUU (Other use, unclassified); PRP
 (Properties); USES (Uses)
 (membrane, hydrogen-permeable; hydrogen-permeable alloy
 membrane and hydrogen-permeable component and production of same)

IT Vapor deposition process
 (vacuum; hydrogen-permeable alloy membrane and
 hydrogen-permeable component and production of same)

IT Palladium alloy, base
 RL: DEV (Device component use); NUU (Other use, unclassified); PRP
 (Properties); USES (Uses)
 (membrane containing; hydrogen-permeable alloy membrane and
 hydrogen-permeable component and production of same)

IT 7440-05-3, Palladium, properties
 RL: DEV (Device component use); NUU (Other use, unclassified); PRP
 (Properties); USES (Uses)
 (membrane containing; hydrogen-permeable alloy membrane and
 hydrogen-permeable component and production of same)

IT 39309-40-5 86511-28-6, Palladium alloy,
 Pd,B 706809-22-5 706809-23-6
 RL: DEV (Device component use); PRP (Properties); USES (Uses)
 (membrane, hydrogen-permeable; hydrogen-permeable alloy
 membrane and hydrogen-permeable component and production of same)

IT 11134-23-9, SUS316L
 RL: DEV (Device component use); PRP (Properties); USES (Uses)
 (porous support; hydrogen-permeable alloy
 membrane and hydrogen-permeable component and production of same)

IT 1333-74-0, Hydrogen, processes
 RL: PEP (Physical, engineering or chemical process); PYP (Physical
 process); PROC (Process)
 (purification/separation of; hydrogen-permeable alloy membrane
 and hydrogen-permeable component and production of same for)

L379 ANSWER 27 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:484924 Document No. 141:280243 Effect of CeO₂ interlayer on ZrO₂ electrolyte/La(Sr)CoO₃ cathode for low-temperature SOFCs. Shiono, Mitsunobu; Kobayashi, Kenichi; Lan Nguyen, Tuong; Hosoda, Kan; Kato, Toru; Ota, Kenichiro; Dokiya, Masayuki (Graduate School of Environment and Information Sciences, Yokohama National University, Yokohama, Hodogaya, 240-8501, Japan). Solid State Ionics, 170(1-2), 1-7 (English) 2004. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

- AB Porous Ce0.9Gd0.1O₂-δ (GDC) and dense Ce0.8Sm0.2O₂-δ (SDC) protection interlayer were introduced between Scandia-stabilized zirconia (SSZ) electrolyte and La_{0.6}Sr_{0.4}CoO₃-δ (LSC) cathode of low- temperature SOFCs which operate at 600-800 °C. The reactivity of the interlayer and the area-specific resistance (ASR) were investigated. EPMA anal. clearly showed that the reaction between LSC cathode and SSZ electrolyte did not occur even though GDC interlayer (3-6 μm) was porous. Moreover, the reaction between GDC interlayer and SSZ electrolyte which were fired at 1320 °C was not observed. The ASR of LSC/GDC/SSZ measured by an AC impedance method was reduced 40% or more at each temperature compared to LSC cathode on a GDC pellet and showed a low value in 600-800 °C. Thin and relatively dense SDC interlayer (<1 μm) was fabricated between LSC cathode and SSZ electrolyte by using 2-ethylhexanoic acid salts of Sm and Ce, and also in the system using this SDC thin interlayer, low ASR equivalent to LSC/GDC/SSZ was shown, and it became clear that the interlayer in this experiment is very effective in the reduction of ASR.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49
- ST ceria interlayer zirconia electrolyte LSC cathode low temp SOFC
- IT Electric impedance
 Electric resistance
 Fuel cell cathodes
 Fuel cell electrolytes
 (CeO₂ interlayer effect on ZrO₂ electrolyte/La(Sr)CoO₃ cathode for low-temperature SOFCs)
- IT Fuel cells
 (solid oxide; CeO₂ interlayer effect on ZrO₂ electrolyte /La(Sr)CoO₃ cathode for low-temperature SOFCs)
- IT 10026-22-9, Nitric acid, cobalt(2+) salt, hexahydrate
 10042-76-9, Nitric acid, strontium salt 10277-43-7,
 Nitric acid, lanthanum(3+) salt, hexahydrate
 RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (CeO₂ interlayer effect on ZrO₂ electrolyte/La(Sr)CoO₃ cathode for low-temperature SOFCs)
- IT 110620-52-5D, Cobalt lanthanum strontium oxide (CoLa_{0.6}Sr_{0.4}O₃), oxygen-depleted 162105-72-8D, Cerium samarium oxide (Ce_{0.8}Sm_{0.2}O₂), oxygen-depleted 183546-68-1D, Cerium gadolinium oxide (Ce_{0.9}Gd_{0.1}O₂), oxygen-depleted 309934-52-9, Cerium scandium zirconium oxide (Ce_{0.01}Sc_{0.2}Zr_{0.8}O₂.1)
 RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
 (CeO₂ interlayer effect on ZrO₂ electrolyte/La(Sr)CoO₃ cathode for low-temperature SOFCs)

L379 ANSWER 28 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:431502 Document No. 141:126244 Proton Conductive Polyimide Electrolytes Containing Fluorenyl Groups: Synthesis, Properties, and Branching Effect. Miyatake, Kenji; Zhou, Hua; Watanabe, Masahiro (Clean Energy Research Center,

- University of Yamanashi, Kofu, 400-8510, Japan). *Macromolecules*, 37(13), 4956-4960 (English) 2004. CODEN: MAMOBX. ISSN: 0024-9297.
 Publisher: American Chemical Society.
- AB** Novel sulfonated polyimide copolymers as **electrolytes** for high-temperature fuel cell applications are reported. Sulfonated polyimide copolymers (SPIH-X; X refers to molar percentage of fluorenyl content) containing 0-60 mol % of fluorenyl groups as hydrophobic component were synthesized, of which **electrolyte** properties were studied and compared to those of the perfluorinated ionomer (Nafion 112). High-mol.-weight copolymers with good film-forming capability were obtained. Thermal stability with decomposition **temperature** of ca. 280 °C and no glass transition **temperature** was confirmed for the copolymers. SPIH shows unique water uptake behavior with the maximum value of 57% at X = 30. Water mols. absorbed in the **electrolyte** membrane with this specific composition do not evaporate easily so that the high **proton conductivity** of 1.67 S cm⁻¹ was obtained at 120° and 100% RH. The branching and crosslinking of SPIH-30 were carried out by applying 2 mol % of trifunctional monomer (melamine) in the polymerization and by electron beam irradiation upon the membrane. The branching and crosslinking are effective to improve oxidative stability and mech. strength. Although the **proton conductivity** decreases slightly by the branching and crosslinking, it still remains at the comparable level to that of Nafion 112.
- CC** 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 35, 38, 72, 76
- ST** **proton conductive polyimide electrolyte**
 fluorenyl group branching sulfonated membrane; **fuel** cell separator membrane polyelectrolyte arom polyimide mech strength
- IT** Polyimides, uses
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 (fluorene group- and fluorine-containing, cardo, aryl, sulfonate-containing; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT** Polyoxyalkylenes, uses
 RL: DEV (Device component use); USES (Uses)
 (fluorine- and sulfo-containing, ionomers, electrode binder; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT** Current density
 (from methanol crossover, voltage and humidity effect on; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT** Electric current-potential relationship
 (of assembled **fuel cell**; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT** Stability
 (oxidative; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT** Carbon fibers, uses
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (paper, anode support; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT** Fluoropolymers, uses
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic

preparation); PREP (Preparation); USES (Uses)
 (polyimide-, fluorene group-containing, cardo, aryl,
 sulfonate-containing; synthesis, properties, and DMFC performance of
proton conductive polyimide electrolytes containing
trifluoromethyl groups)

IT Cardo polymers
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
 preparation); PREP (Preparation); USES (Uses)
 (polyimides, fluorene group- and fluorine-containing, aryl,
 sulfonate-containing; synthesis, properties, and DMFC performance of
proton conductive polyimide electrolytes containing
trifluoromethyl groups)

IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses)
 (polyoxyalkylene-, sulfo-containing, ionomers, electrode binder;
 synthesis, properties, and DMFC performance of **proton**
conductive polyimide electrolytes containing trifluoromethyl
groups)

IT Ionomers
 RL: DEV (Device component use); USES (Uses)
 (polyoxyalkylenes, fluorine- and sulfo-containing, electrode binder;
 synthesis, properties, and DMFC performance of **proton**
conductive polyimide electrolytes containing trifluoromethyl
groups)

IT Ion exchange membranes
 (preparation and ion exchange capacity of; synthesis, properties, and
 DMFC performance of **proton conductive**
polyimide electrolytes containing trifluoromethyl groups)

IT Ionic conductivity
 (**proton**; synthesis, properties, and DMFC performance of
proton conductive polyimide electrolytes containing
trifluoromethyl groups)

IT Crosslinking
 (radiochem.; synthesis, properties, and DMFC performance of
proton conductive polyimide electrolytes containing
trifluoromethyl groups)

IT Fuel cell separators
 Fuel cells
 Membrane electrodes
 Membranes, nonbiological
 Polyelectrolytes
 (synthesis, properties, and DMFC performance of **proton**
conductive polyimide electrolytes containing
trifluoromethyl groups)

IT Carbon black, uses
 RL: DEV (Device component use); USES (Uses)
 (synthesis, properties, and DMFC performance of **proton**
conductive polyimide electrolytes containing trifluoromethyl
groups)

IT Fluoropolymers, uses
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
 preparation); PREP (Preparation); USES (Uses)
 (synthesis, properties, and DMFC performance of **proton**
conductive polyimide electrolytes containing trifluoromethyl
groups)

IT 117-61-3P, 4,4'-Diamino-2,2'-biphenyldisulfonic acid
 RL: PUR (Purification or recovery); RCT (Reactant); PREP
 (Preparation); RACT (Reactant or reagent)
 (DAPS; synthesis, properties, and DMFC performance of
proton conductive polyimide electrolytes containing
trifluoromethyl groups)

IT 15499-84-0, 4,4'-(9-Fluorenylidene)dianiline
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (FDA; synthesis, properties, and DMFC performance of
proton conductive polyimide electrolytes containing
trifluoromethyl groups)

- IT 7732-18-5, Water, processes
 RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
 (absorption of; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 7720-78-7, Ferrous sulfate
 RL: CAT (Catalyst use); USES (Uses)
 (for oxidative stability; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 500783-35-7P
 RL: PRP (Properties); PUR (Purification or recovery); SPN (Synthetic preparation); PREP (Preparation)
 (plain and crosslinked; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 42615-02-1
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 67-56-1, Methanol, uses
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 7440-06-4, Platinum, uses 7440-57-5, Gold, uses
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 108-39-4, m-Cresol, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 481001-37-0P 724457-95-8P
 RL: PRP (Properties); PUR (Purification or recovery); SPN (Synthetic preparation); PREP (Preparation)
 (synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 163294-14-2, Nafion 112
 RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)
- IT 65-85-0, Benzoic acid, reactions 81-30-1, 1,4,5,8-Naphthalenetetracarboxylic dianhydride 108-78-1, Melamine, reactions 121-44-8, Triethylamine, reactions 7722-84-1, Hydrogen peroxide, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes containing trifluoromethyl groups**)

L379 ANSWER 29 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:287992 Document No. 140:306758 Electrode-supported
 fuel cell. Rietveld, Gijsbertus; Van Druten,
 Gerry Martina Regina (Stichting Energieonderzoek Centrum Nederland,
 Neth.). PCT Int. Appl. WO 2004030133 A1 20040408, 11 pp.

DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English).
 CODEN: PIXXD2. APPLICATION: WO 2003-NL663 20030929. PRIORITY: NL 2002-1021547 20020927.

- AB Cathode-supported fuel cell wherein the cathode support comprises a porous part made of an alloy containing iron and chromium and more particularly stainless steel. The anode has a thickness of 1-50 µm and preferably consists of nickel/nickel oxide. The cathode preferably consists of LSM material. Such an electrode-supported fuel cell can be produced by providing a metallic support containing at least iron or chromium by means of sintering, preferably starting from a powder, successively applying thereto an electrode, electrolyte and other electrodes. With this method, a cathode is applied to the metallic support and the combination obtained is sintered at a temperature between 1000 and 1200°.
- IT 7440-47-3, Chromium, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (cathode support; electrode-supported fuel cell)
- RN 7440-47-3 HCAPLUS
 CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

- IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); USES (Uses)
 (electrode-supported fuel cell)
- RN 7440-02-0 HCAPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

- IC ICM H01M008-02
 ICS H01M008-24
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 55
 ST electrode supported fuel cell
 IT Alloys, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (cathode support; electrode-supported fuel cell)
 IT Fuel cell anodes
 Fuel cell cathodes
 Fuel cells
 Printing (impact)
 Sintering
 (electrode-supported fuel cell)
 IT Powders
 (sintered, cathode support; electrode-supported fuel cell)
 IT Coating process
 (spin; electrode-supported fuel cell)

IT 7439-89-6, Iron, uses 7440-47-3,
 Chromium, uses 11122-73-9 12597-68-1, Stainless steel,
 uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (cathode support; electrode-supported
 fuel cell)

IT 1313-99-1, Nickel oxide, uses 7440-02-0,
 Nickel, uses 59707-46-9, Lanthanum manganese
 strontium oxide
 RL: DEV (Device component use); USES (Uses)
 (electrode-supported fuel cell)

IT 11133-82-7
 RL: TEM (Technical or engineered material use); USES (Uses)
 (electrode-supported fuel cell)

L379 ANSWER 30 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:275234 Document No. 141:74133 The influence of noble-
 metal-containing cathodes on the electrochemical performance
 of anode-supported SOFCs. Haanappel, V. A. C.; Rutenbeck,
 D.; Mai, A.; Uhlenbruck, S.; Sebold, D.; Wesemeyer, H.; Rowekamp,
 B.; Tropatz, C.; Tietz, F. (Institute for Materials and Processes
 in Energy Systems, Forschungszentrum Julich, Julich, 52425,
 Germany). Journal of Power Sources, 130(1-2), 119-128 (English)
 2004. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science
 B.V..

AB To enhance the catalytic activity of the cathode for oxygen reduction
 and thus to increase the electrochem. performance of planar anode-
 supported solid oxide fuel cells, Pd,
 Ag, or Pt was added to the cathode. Four routes were used to add
 these noble metals: infiltration of the cathode with a Pd
 solution, deposition of Pt on the electrolyte surface
 , mixing of La_{0.65}Sr_{0.30}MnO₃ (LSM) and YSZ cathode powders with
 different metal precursors (Pt and Pd black, Pd on
 activated carbon, Ag powder, Ag₂O, Ag acetate, Ag citrate, Ag₂CO₃,
 colloidal Ag, AgNO₃), and synthesis of LSM powder with the addition of
 AgNO₃. Between 750 and 900° no electrocatalytic effect
 occurred with respect to the presence of Pt, either added by
 deposition on the electrolyte or by mixing with cathode
 powders. Infiltration of the cathode with a Pd solution or mixing with
 Pd black did not result in a pos. effect either. A catalytic effect
 was only found with Pd on activated carbon and in particular at
 lower temps. Cells prepared with Ag powder and Ag₂O showed
 an improved electrochem. performance compared to Ag-free cells
 sintered at the same temperature (920°). However, in
 comparison to Ag-free cells sintered at the standard temperature
 (1100°) lower current densities were measured. This can be
 explained by a weak contact between electrolyte and
 cathode functional layer and an insufficiently sintered
 cathode. A detrimental effect was observed regarding the addition of the
 other Ag precursors. Thermal decomposition of these precursors gave
 large pores in the cathode.

IT 7440-05-3, Palladium, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (influence of noble-metal-containing cathodes on
 electrochem. performance of anode-supported SOFCs)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 57, 72, 76
 ST noble metal cathode anode supported solid oxide
 fuel cell; YSZ LSM cathode metal precursor deposition

- current density potential
- IT Electric resistance
 - (area-specific; comparison of current-voltage relationships for fuel cells with different cathode metal catalysts, silver precursors and content level, bias voltages, and temps.)
- IT Noble metals
 - RL: CAT (Catalyst use); DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 - (comparison of current-voltage relationships for fuel cells with different cathode metal catalysts, silver precursors and content level, bias voltages, and temps.)
- IT Coprecipitation
- Fuel cell cathodes
- Impregnation
- Vapor deposition process
 - (influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT Current density
 - Electric current-potential relationship
 - (of assembled fuel cells; comparison of current-voltage relationships for fuel cells with different cathode metal catalysts, silver precursors and content level, bias voltages, and temps.)
- IT Fuel cells
 - (solid oxide; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 157975-55-8P, Lanthanum manganese strontium oxide (La_{0.65}MnSr_{0.30}3)
 - RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 - (LSM, cathode, and layer with 8YSZ; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-44-0, Carbon, uses
 - RL: DEV (Device component use); USES (Uses)
 - (activated, with Pd, in cathode composite fabrication; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-02-0P, Nickel, uses
 - RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 - (anode cermet with 8YSZ and mesh; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 403694-09-7, 8YSZ
 - RL: DEV (Device component use); USES (Uses)
 - (anode cermet with Ni, and electrolyte layer, cathode functional layer with LSM; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-05-3, Palladium, uses
 - RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 - (influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-22-4P, Silver, uses
 - RL: CAT (Catalyst use); DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 - (influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 1333-74-0, Hydrogen, uses
 - RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); TEM (Technical or engineered material use); PROC (Process); RACT (Reactant or reagent); USES (Uses)
 - (influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-06-4, Platinum, uses

RL: CAT (Catalyst use); DEV (Device component use); USES (Uses) (powder and mesh on cathode side; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)

IT 534-16-7 563-63-3, Silver acetate 7761-88-8, Silver nitrate, reactions 20667-12-3, Silver oxide (Ag₂O) 36701-38-9, Silver citrate
 RL: PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent) (precursor; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)

L379 ANSWER 31 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:204125 Document No. 140:202496 Fuel cell electrode. Scott, Keith; Cheng, Hua (Newcastle University Ventures Limited, UK). PCT Int. Appl. WO 2004021486 A2 20040311, 61 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2.
 APPLICATION: WO 2003-GB3715 20030827. PRIORITY: GB 2002-19955 20020828.

AB The invention concerns a fuel cell having an electrode comprising an electrocatalyst on a support, wherein the support is a mesh of conductive material, as well as a method of operating such a fuel cell by contacting a fuel and an oxidant on the electrode. The electrolyte is an ion exchange membrane. The electrocatalyst is a metal, metal alloy, metal oxide, or metal hydride.

IT 7440-32-6, Titanium, uses
 RL: TEM (Technical or engineered material use); USES (Uses) (support; fuel cell electrode)

RN 7440-32-6 HCAPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IC ICM H01M008-00
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 IT Polyoxyalkylenes, uses
 RL: DEV (Device component use); USES (Uses) (fluorine- and sulfo-containing, ionomers; fuel cell electrode)
 IT Fuel cell anodes
 Fuel cell cathodes
 Ion exchange membranes (fuel cell electrode)
 IT Alloys, uses
 Hydrides
 Metals, uses
 Oxides (inorganic), uses
 RL: CAT (Catalyst use); USES (Uses) (fuel cell electrode)
 IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses) (polyoxyalkylene-, sulfo-containing, ionomers; fuel cell electrode)
 IT Ionomers
 RL: DEV (Device component use); USES (Uses)

(polyoxyalkylenes, fluorine- and sulfo-containing; fuel cell electrode)

IT Fuel cells

(solid electrolyte; fuel cell electrode)

IT Titanium alloy, base

RL: TEM (Technical or engineered material use); USES (Uses) (support; fuel cell electrode)

IT 7440-32-6, Titanium, uses

RL: TEM (Technical or engineered material use); USES (Uses) (support; fuel cell electrode)

L379 ANSWER 32 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:41397 Document No. 140:61782 Metal oxides prepared by flame spray pyrolysis. Stark, Wendelin J.; Maedler, Lutz; Pratsinis, Sotiris E. (Eidgenoessische Technische Hochschule Zuerich, Switz.). PCT Int. Appl. WO 2004005184 A1 20040115, 45 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2003-IB2172 20030520. PRIORITY: EP 2002-14100 20020703; US 2002-2002/PV394965 20020709.

AB Metal oxides, especially zirconia stabilized with ceria or yttria, are prepared by flame spray pyrolysis. The metal oxide precursors are dissolved in a mixture of carboxylic acids, preferably acetic acid and lauric acid at a ratio of 1:1, and the mixture is subjected to a flame having a temperature of 1600-2600°C. The solvent has an enthalpy of at least 15 kJ/g, preferably at least about 23.7 kJ/g. The metal oxide precursors are organic salts, especially cerium acetate hydrate and zirconium acetylacetone. The produced mixed oxide is phase stable upon heating at 900° for 2 h in air. The mixed oxide has a dynamic oxygen storage capacity after heat treatment at 700° for 16 h in air of at least 1.5 L O₂/kg catalyst and is therefore suitable as a three-way catalyst material for internal combustion engines. The ceria/zirconia mixed oxide can be mixed with a monolithic structure giving material, such as Al₂O₃. The catalyst can contain addnl. catalytically active substances, such as further metal oxides, e.g. titania, vanadia, chromia, manganese, iron, cobalt, nickel, copper oxides, and/or noble metals, e.g. platinum, palladium, rhodium, ruthenium, rhenium, and iridium. The mixed oxide can be used for mechanochem. polishing, as heterogeneous catalysts, as structural ceramics, as battery storage materials, for chemical sensors, for elements in energy production, for solar energy production elements, for electron storage in recyclable battery units, as dielect., as ferroelec., as gas permeable membranes, as pigments, polymer additives, stabilizers, magnetic fluids, polishing powders, additives in metal alloys, in armor fabrication, in microelectronics, as electrode raw material, as phosphors for radiation sensitive elements and in displays, cosmetics, pharmaceutical packaging, additive in food and pharmaceutical applications, fuel cells, and/or superconductors.

IT 7440-05-3, Palladium, uses

RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses) (metal oxides prepared by flame spray pyrolysis)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C01B013-34
 ICS C01F017-00; C01G025-02; C01G025-00; B01J023-00; B01J023-10;
 B01J035-10; B01J023-63; C09K003-14; B01J023-42

CC 49-3 (Industrial Inorganic Chemicals)
 Section cross-reference(s): 57, 59, 67

IT Polishing
 (chemical-mech.; metal oxides prepared by flame spray pyrolysis)

IT Exhaust gas catalytic converters
 (metal oxides prepared by flame spray pyrolysis)

IT Calcination
 (spray; metal oxides prepared by flame spray pyrolysis)

IT Catalysts
 (three-way; metal oxides prepared by flame spray pyrolysis)

IT 1344-28-1, Aluminum oxide (Al₂O₃), uses
 RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
 (catalyst support; metal oxides prepared by flame spray pyrolysis)

IT 1308-38-9, Chromium oxide (Cr₂O₃), uses 1313-99-1,
 Nickel oxide (NiO), uses 1314-62-1, Vanadium oxide (V₂O₅), uses 1332-37-2, Iron oxide, uses 1344-70-3, Copper oxide 7439-88-5, Iridium, uses 7439-96-5, Manganese, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-15-5, Rhenium, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 11104-61-3, Cobalt oxide 13463-67-7, Titanium oxide (TiO₂), uses
 RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
 (metal oxides prepared by flame spray pyrolysis)

IT 17501-44-9 133648-99-4
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (metal oxides prepared by flame spray pyrolysis)

IT 64-19-7, Acetic acid, uses 143-07-7, Dodecanoic acid, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (solvent; metal oxides prepared by flame spray pyrolysis)

IT 7782-44-7, Oxygen, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (storage; metal oxides prepared by flame spray pyrolysis)

IT 1314-23-4, Zirconium oxide (ZrO₂), uses
 RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
 (yttria or ceria-stabilized; metal oxides prepared by flame spray pyrolysis)

IT 1306-38-3, Cerium oxide (CeO₂), uses 1314-36-9, Yttrium oxide (Y₂O₃), uses
 RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
 (zirconia stabilized with; metal oxides prepared by flame spray pyrolysis)

L379 ANSWER 33 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:39663 Document No. 140:62378 Molten hydride fuel cell.
 Roy, Prodyot; Salamah, Samir Armando; Rodgers, Douglas Noss (General Electric Company-Global Research Center, USA). U.S. Pat. Appl. Publ. US 2004009390 A1 20040115, 8 pp. (English). CODEN: USXXCO.

APPLICATION: US 2002-64408 20020710.

AB A fuel cell assembly comprises at least one fuel cell. The fuel cell comprises an anode and a cathode held in a spaced apart relationship by at least one spacer element comprising an elec. insulating material. A proximal end of the spacer element is in contact with the cathode, and a distal end is in contact with the anode. An electrolyte is disposed between, and in contact with the anode and the cathode. The electrolyte comprises a molten

salt having a hydride ion conductance number greater than about 0.95 at a fuel cell operating temperature. A fuel gas inlet, adjacent to the cathode, is provided for delivering a fuel gas to the electrolyte. An oxidizing gas inlet, adjacent to the anode, is provided for delivering an oxidizing gas to the electrolyte. An exhaust port is in fluid communication with the anode.

IT 7440-05-3, Palladium, uses 7440-62-2,
Vanadium, uses 12735-99-8
RL: TEM (Technical or engineered material use); USES (Uses)
(membrane; molten hydride fuel cell)

RN 7440-05-3 HCPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-62-2 HCPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

RN 12735-99-8 HCPLUS
CN Silver alloy, nonbase, Ag,Pd (9CI) (CA INDEX NAME)

Component	Component
	Registry Number
=====+=====	=====+=====
Ag	7440-22-4
Pd	7440-05-3

IT 7440-32-6, Titanium, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(β -, membrane; molten hydride fuel cell)

RN 7440-32-6 HCPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IC ICM H01M008-14
ICS H01M004-94
INCL 429046000; 429040000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST fuel cell molten hydride
IT Membranes, nonbiological
(hydrogen-permeable; molten hydride fuel cell)
IT Fuel cell anodes
Fuel cell cathodes
Fuel cells
Refractories
(molten hydride fuel cell)
IT Hydrides
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(molten hydride fuel cell)
IT Alkali metal halides, uses
Alkali metal hydrides
Salts, uses
RL: DEV (Device component use); USES (Uses)
(molten; molten hydride fuel cell)

IT Silicate glasses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (spacer; molten hydride fuel cell)

IT 7440-05-3, Palladium, uses 7440-62-2,
 Vanadium, uses 12735-99-8
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membrane; molten hydride fuel cell)

IT 7782-44-7, Oxygen, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 (molten hydride fuel cell)

IT 74-82-8, Methane, uses 74-98-6, Propane, uses 1333-74-0,
 Hydrogen, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (molten hydride fuel cell)

IT 7447-40-7, Potassium chloride (KCl), uses 7447-41-8, Lithium chloride (LiCl), uses 7550-35-8, Lithium bromide (LiBr)
 7580-67-8, Lithium hydride (LiH) 7646-69-7, Sodium hydride (NaH) 7647-14-5, Sodium chloride, uses 7647-15-6, Sodium bromide (NaBr), uses 7681-49-4, Sodium fluoride, uses 7693-26-7, Potassium hydride 7758-02-3, Potassium bromide (KBr), uses 7789-23-3, Potassium fluoride (KF)
 7789-24-4, Lithium fluoride, uses
 RL: DEV (Device component use); USES (Uses)
 (molten; molten hydride fuel cell)

IT 7439-98-7, Molybdenum, uses 7440-15-5, Rhenium, uses 7440-33-7,
 Tungsten, uses
 RL: DEV (Device component use); USES (Uses)
 (refractory; molten hydride fuel cell)

IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 10043-11-5,
 Boron nitride, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (spacer; molten hydride fuel cell)

IT 7440-32-6, Titanium, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (β -, membrane; molten hydride fuel cell)

L379 ANSWER 34 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:17779 Document No. 140:62322 Ionic conductors
 containing amorphous silica gel for fuel cell
 electrolytes and secondary lithium battery
 electrolytes. Mori, Hiroshi; Tezuka, Makoto (Mitsubishi
 Chemical Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2004002114 A2
 20040108, 20 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
 2002-160636 20020531.

AB The silica gel has pore volume 0.3-3.0 mL/g, sp. surface area 200-1000 m²/g, a pore size distribution having a peak at 20 nm, and solid Si-NMR spectrum having prescribed chemical shift (δ ppm) of Q4 peak (definition given). The ionic conductors contain ionic conductive compds. or compns. (either proton conductive or Li ion conductive) in addition to the silica gel supports. Thus, tetramethoxysilane was hydrolyzed, gelated, and hydrothermally treated to give the silica gel which was then soaked in an aqueous H₃PO₄ solution to carry H₃PO₄ (proton conductor). The obtained proton conductor showed excellent performance at a wide temperature region.

IC ICM C01B033-152
 ICS H01B001-06; H01M008-02; H01M010-40
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 76
 ST ionic conductor support amorphous
 silica gel; proton conductor support
 amorphous silica gel; fuel cell
 electrolyte amorphous silica gel; lithium battery
 electrolyte amorphous silica gel
 IT Silica gel, uses

- RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
- (amorphous; ionic conductors containing amorphous silica gel supports useful for fuel cell electrolytes and secondary Li battery electrolytes)
- IT Fuel cell electrolytes
- Ionic conductors
- Solid electrolytes
- (ionic conductors containing amorphous silica gel supports useful for fuel cell electrolytes and secondary Li battery electrolytes)
- IT Battery electrolytes
- (lithium; ionic conductors containing amorphous silica gel supports useful for fuel cell electrolytes and secondary Li battery electrolytes)
- IT 681-84-5, Tetramethoxysilane
- RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
- (hydrolysis, gelation, and hydrothermal treatment of; ionic conductors containing amorphous silica gel supports useful for fuel cell electrolytes and secondary Li battery electrolytes)
- IT 7664-38-2, Phosphoric acid, uses
- RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
- (proton conductor; ionic conductors containing amorphous silica gel supports useful for fuel cell electrolytes and secondary Li battery electrolytes)

L379 ANSWER 35 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:17411 Document No. 140:44264 Metal oxides prepared by flame spray pyrolysis. Stark, Wendelin J.; Maedler, Lutz; Pratsinis, Sotiris E. (Eidgenoessische Technische Hochschule Zuerich, Switz.). Eur. Pat. Appl. EP 1378489 A1 20040107, 24 pp.
 DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, SK. (English). CODEN: EPXXDW. APPLICATION: EP 2002-14100 20020703.

AB Metal oxides, especially zirconia stabilized with ceria or yttria, are prepared by flame spray pyrolysis. The metal oxide precursors are dissolved in a mixture of carboxylic acids, preferably acetic acid and lauric acid at a ratio of 1:1, and the mixture is subjected to a flame having a temperature of 1600-2600°C. The solvent has an enthalpy of at least 15 kJ/g, preferably at least about 23.7 kJ/g. The metal oxide precursors are organic salts, especially cerium acetate hydrate and zirconium acetylacetone. The produced mixed oxide is phase stable upon heating at 900° for 2 h in air. The mixed oxide has a dynamic oxygen storage capacity after heat treatment at 700° for 16 h in air of at least 1.5 L O₂/kg catalyst and is therefore suitable as a three-way catalyst material for internal combustion engines. The ceria/zirconia mixed oxide can be mixed with a monolithic structure giving material, such as Al₂O₃. The catalyst can contain addnl. catalytically active substances, such as further metal oxides, e.g. titania, vanadia, chromia, manganese, iron, cobalt, nickel, copper oxides, and/or noble metals, e.g. platinum, palladium, rhodium, ruthenium, rhenium, and iridium. The mixed oxide can be used for mechanochem. polishing, as heterogeneous catalysts, as structural ceramics, as battery storage materials, for

chemical sensors, for elements in energy production, for solar energy production elements, for electron storage in recyclable battery units, as dielecs., as ferroelec., as gas permeable membranes, as pigments, polymer additives, stabilizers, magnetic fluids, polishing powders, additives in metal alloys, in armor fabrication, in microelectronics, as electrode raw material, as phosphors for radiation sensitive elements and in displays, cosmetics, pharmaceutical packaging, additive in food and pharmaceutical applications, fuel cells, and/or superconductors.

IT 7440-05-3, Palladium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (metal oxides prepared by flame spray pyrolysis)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C01B013-34
 ICS C01F017-00; C01G025-02; C01G025-00; B01J023-00; B01J023-10;
 B01J035-10; B01J023-63; C09K003-14

CC 49-3 (Industrial Inorganic Chemicals)
 Section cross-reference(s): 57, 59, 67

IT Polishing
 (chemical-mech.; metal oxides prepared by flame spray pyrolysis)

IT Exhaust gas catalytic converters
 (metal oxides prepared by flame spray pyrolysis)

IT Calcination
 (spray, flame; metal oxides prepared by flame spray pyrolysis)

IT Catalysts
 (three-way; metal oxides prepared by flame spray pyrolysis)

IT 1344-28-1, Alumina, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst support; metal oxides prepared by flame spray pyrolysis)

IT 1308-38-9, Chromia, uses 1313-99-1, Nickel oxide, uses
 1314-62-1, Vanadia, uses 1332-37-2, Iron oxide, uses
 1344-70-3, Copper oxide 7439-88-5, Iridium, uses
 7439-96-5, Manganese, uses 7440-05-3, Palladium,
 uses 7440-06-4, Platinum, uses 7440-15-5, Rhenium, uses
 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 11104-61-3,
 Cobalt oxide 13463-67-7, Titania, uses
 RL: CAT (Catalyst use); USES (Uses)
 (metal oxides prepared by flame spray pyrolysis)

IT 17501-44-9, Zirconium acetylacetone 133648-99-4, Acetic acid,
 cerium(3+) salt, monohydrate
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (metal oxides prepared by flame spray pyrolysis)

IT 64-19-7, Acetic acid, uses 143-07-7, Lauric acid, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (solvent; metal oxides prepared by flame spray pyrolysis)

IT 7782-44-7, Oxygen, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (storage; metal oxides prepared by flame spray pyrolysis)

IT 1314-23-4P, Zirconia, preparation
 RL: CAT (Catalyst use); NUU (Other use, unclassified); SPN
 (Synthetic preparation); PREP (Preparation); USES (Uses)
 (yttria or ceria-stabilized; metal oxides prepared by
 flame spray pyrolysis)

IT 1306-38-3P, Ceria, preparation 1314-36-9P, Yttria, preparation
 RL: CAT (Catalyst use); MOA (Modifier or additive use); NUU (Other

use, unclassified); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 (zirconia stabilized with; metal oxides prepared by flame spray pyrolysis)

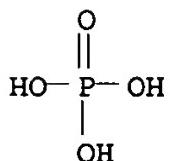
L379 ANSWER 36 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:1012123 Document No. 140:96838 High-Performance Solid Acid Fuel Cells Through Humidity Stabilization. Boysen, Dane A.; Uda, Tetsuya; Chisholm, Calum R. I.; Haile, Sossina M. (Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Science (Washington, DC, United States), 303(5654), 68-70 (English) 2004. CODEN: SCIEAS. ISSN: 0036-8075. Publisher: American Association for the Advancement of Science.

AB State-of-the-art fuel cells based on polymer electrolyte membranes are inoperable >100°, they require cumbersome humidification systems, and suffer from fuel permeation. These difficulties all arise from the hydrated nature of the electrolyte. Solid acids however exhibit anhydrous p transport and high-temperature stability. Continuous, stable power generation for both H₂/O₂ and direct MeOH fuel cells operated at .apprx.250° was demonstrated using a humidity-stabilized solid acid CsH₂PO₄ electrolyte.

IT 18649-05-3, Cesium phosphate (CsH₂PO₄)
 RL: DEV (Device component use); USES (Uses)
 (electrolyte; in humidity stabilization of high-performance fuel cell with solid acid electrolyte)

RN 18649-05-3 HCAPLUS

CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST cesium phosphate solid acid electrolyte humidity stabilization fuel cell
 IT Fuel cell electrolytes
 Fuel cell separators
 Humidity
 (humidity stabilization of high-performance fuel cell with solid acid electrolyte)
 IT 18649-05-3, Cesium phosphate (CsH₂PO₄)
 RL: DEV (Device component use); USES (Uses)
 (electrolyte; in humidity stabilization of high-performance fuel cell with solid acid electrolyte)
 IT 1333-74-0, Hydrogen, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (humidity stabilization of solid acid electrolyte for high-performance fuel cell using)
 IT 67-56-1, Methanol, uses 7782-44-7, Oxygen, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (humidity stabilization of solid acid electrolyte for high-performance fuel cell using)

L379 ANSWER 37 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:989964 Document No. 140:29512 Solid oxide fuel cell with enhanced mechanical and electrical properties. Carter, John David; Bae, Joong-Myeon; Cruse, Terry Alan; Ralph, James Michael; Kumar, Romesh; Krumpelt, Michael (USA). U.S. Pat. Appl. Publ. US 2003232230 A1 20031218, 10 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-167917 20020612.

AB A solid oxide fuel cell (SOFC) repeat unit includes an oxide electrolyte, an anode, a metallic fuel flow field, a metallic interconnect, and a metallic air flow field. The multilayer laminate is made by casting tapes of the different functional layers, laminating the tapes together and sintering the laminate in a reducing atmospheric SOFC stacks are made by applying a cathode layer, bonding the unit into a gas manifold plate, and then stacking the cells together. This process leads to superior mech. properties in the SOFC due to the toughness of the supporting metallic layers. It also reduces contact resistances in stacking the cells since there is only one phys. contact plane for each repeat unit.

IT 7440-02-0, Nickel, uses
RL: DEV (Device component use); USES (Uses)
(solid oxide fuel cell with enhanced mech.
and elec. properties)

RN 7440-02-0 HCPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M008-12
ICS H01M008-24
INCL 429032000; 429038000; 264618000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST fuel cell solid oxide
IT Fuel cell anodes
(ceramic-metal; solid oxide fuel cell
with enhanced mech. and elec. properties)
IT Catalysts
(electrocatalysts; solid oxide fuel cell with
enhanced mech. and elec. properties)
IT Fuel cell electrolytes
Interconnections, electric
(solid oxide fuel cell with enhanced mech.
and elec. properties)
IT Fuel cells
(solid oxide; solid oxide fuel cell with
enhanced mech. and elec. properties)
IT Molding
(tape-casting; solid oxide fuel cell with
enhanced mech. and elec. properties)
IT Nickel alloy, base
RL: DEV (Device component use); USES (Uses)
(solid oxide fuel cell with enhanced mech.
and elec. properties)
IT 1314-36-9, Yttria, uses
RL: MOA (Modifier or additive use); USES (Uses)
(ZrO₂ stabilized with; solid oxide fuel cell
with enhanced mech. and elec. properties)
IT 11129-18-3, Cerium oxide 55030-80-3, Gallium lanthanum
oxide
RL: DEV (Device component use); USES (Uses)
(doped; solid oxide fuel cell with enhanced
mech. and elec. properties)
IT 7440-02-0, Nickel, uses 64417-98-7, Yttrium
zirconium oxide

RL: DEV (Device component use); USES (Uses)
(solid oxide fuel cell with enhanced mech.
and elec. properties)

IT 1314-23-4, Zirconia, uses
RL: DEV (Device component use); USES (Uses)
(yttria-stabilized; solid oxide fuel cell
with enhanced mech. and elec. properties)

L379 ANSWER 38 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:969455 Document No. 140:29505 Thin-film barium-transition
metal oxide-rare earth oxide proton-
conducting solid electrolytes for fuel
cells. Taniguchi, Noboru (Matsushita Electric Industrial
Co., Ltd., Japan). Eur. Pat. Appl. EP 1369949 A2 20031210, 28 pp.
DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI,
LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ,
EE, HU, SK. (English). CODEN: EPXXDW. APPLICATION: EP 2003-12535
20030602. PRIORITY: JP 2002-165456 20020606.

AB A thin-film ($\leq 300 \mu\text{m}$ thickness) proton-
conducting solid electrolyte for a solid-oxide
fuel cell has the general composition
 $\text{Ba}(\text{Zr}_{1-x}\text{Ce}_x)^{1-y}\text{MyAl}_2\text{O}_3 - \alpha$, in which M is one or more trivalent
rare earth cations and In^{3+} ; $y = 0-0.3$; $x = 0-1$; $z =$
 $0-0.4$; and $\alpha = 0-1.5$. The fuel cell
electrode is typically carbon-supported Pt. A solid-
electrolyte fuel cell can obtain a cell
output even at low temperature (i.e., $\leq 500^\circ$).

IT 288866-05-7P, Barium cerium neodymium zirconium oxide
($\text{BaCe}_{0.4}\text{Nd}_{0.2}\text{Zr}_{0.403}$) 386720-65-6P, Barium cerium
gadolinium zirconium oxide ($\text{BaCe}_{0.2}\text{Gd}_{0.2}\text{Zr}_{0.603}$)
632286-96-5P, Barium cerium gadolinium zirconium oxide
($\text{BaCe}_{0.24}\text{Gd}_{0.24}\text{Zr}_{0.5203}$) 632286-97-6P, Barium cerium
gadolinium zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.2}\text{Zr}_{0.5603}$)
632287-08-2P, Barium cerium gadolinium zirconium oxide
($\text{BaCe}_{0.2}\text{Gd}_{0.4}\text{Zr}_{0.403}$)
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
preparation); TEM (Technical or engineered material use); PREP
(Preparation); USES (Uses)
(oxygen-deficient, proton conductors;
thin-film barium-transition metal oxide-rare earth
oxide proton-conducting solid
electrolytes for fuel cells)

RN 288866-05-7 HCAPLUS
CN Barium cerium neodymium zirconium oxide ($\text{BaCe}_{0.4}\text{Nd}_{0.2}\text{Zr}_{0.403}$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Ce	0.4	7440-45-1
Ba	1	7440-39-3
Nd	0.2	7440-00-8

RN 386720-65-6 HCAPLUS
CN Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.2}\text{Gd}_{0.2}\text{Zr}_{0.603}$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1

Ba	1	7440-39-3
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RN 632286-96-5 HCPLUS
 CN Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.24}\text{Zr}_{0.52}\text{O}_3$)
 (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.52	7440-67-7
Gd	0.24	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632286-97-6 HCPLUS
 CN Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.2}\text{Zr}_{0.56}\text{O}_3$)
 (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.56	7440-67-7
Gd	0.2	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632287-08-2 HCPLUS
 CN Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.2}\text{Gd}_{0.4}\text{Zr}_{0.4}\text{O}_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Gd	0.4	7440-54-2
Ce	0.2	7440-45-1
Ba	1	7440-39-3

IC ICM H01M008-12
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49

ST solid oxide proton conducting fuel
 cell electrolyte; barium transition metal
 rare earth oxide solid electrolyte; aluminum barium
 zirconium oxide solid electrolyte fuel
 cell

IT Rare earth oxides
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (aluminum barium zirconium transition metal oxides,
 electrolytes; thin-film barium-transition metal
 oxide-rare earth oxide proton-conducting
 solid electrolytes for fuel cells)

IT Transition metal oxides
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (barium rare earth oxides, electrolyte; thin-film
 barium-transition metal oxide-rare earth oxide
 proton-conducting solid electrolytes
 for fuel cells)

IT Rare earth oxides

RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(barium transition metal oxides, electrolyte; thin-film barium-transition metal oxide-rare earth oxide proton-conducting solid electrolytes for fuel cells)

IT Ionic conductivity

Ionic conductors

(proton; thin-film barium-transition metal oxide-rare earth oxide proton-conducting solid electrolytes for fuel cells)

IT Fuel cells

(solid electrolyte; thin-film barium-transition metal oxide-rare earth oxide proton-conducting solid electrolytes for fuel cells)

IT Fuel cell electrolytes

(solid-oxide; thin-film barium-transition metal oxide-rare earth oxide proton-conducting solid electrolytes for fuel cells)

IT 7440-06-4, Platinum, uses

RL: DEV (Device component use); USES (Uses)

(electrode; thin-film barium-transition metal oxide-rare earth oxide proton-conducting solid electrolytes for fuel cells)

IT 134775-34-1P, Barium cerium praseodymium oxide ($BaCe0.8Pr0.2O_3$)
 144378-46-1P, Barium cerium gadolinium oxide ($BaCe0.8Gd0.2O_3$)
 148791-56-4P, Barium cerium dysprosium oxide ($BaCe0.8Dy0.2O_3$)
 148972-97-8P, Barium cerium samarium oxide ($BaCe0.8Sm0.2O_3$)
 162759-81-1P, Barium cerium erbium oxide ($BaCe0.8Er0.2O_3$)
 170023-54-8P, Barium cerium terbium oxide ($BaCe0.8Tb0.2O_3$)
 237055-46-8P, Barium cerium lanthanum oxide ($BaCe0.8La0.2O_3$)
 288865-89-4P, Barium cerium yttrium zirconium oxide
 ($BaCe0.4Y0.2Zr0.4O_3$) 288866-05-7P, Barium cerium neodymium zirconium oxide ($BaCe0.4Nd0.2Zr0.4O_3$) 288866-24-0P, Barium cerium indium zirconium oxide ($BaCe0.4In0.2Zr0.4O_3$) 288866-28-4P, Barium cerium indium zirconium oxide ($BaCe0.5In0.2Zr0.3O_3$)
 386720-65-6P, Barium cerium gadolinium zirconium oxide
 ($BaCe0.2Gd0.2Zr0.6O_3$) 632286-92-1P, Barium cerium ytterbium zirconium oxide ($BaCe0.4Yb0.2Zr0.4O_3$) 632286-93-2P, Aluminum barium cerium gadolinium oxide ($Al0.02BaCe0.8Gd0.2O_3$) 632286-94-3P
 632286-95-4P 632286-96-5P, Barium cerium gadolinium zirconium oxide ($BaCe0.24Gd0.24Zr0.52O_3$) 632286-97-6P,
 Barium cerium gadolinium zirconium oxide ($BaCe0.24Gd0.2Zr0.56O_3$)
 632286-98-7P 632286-99-8P 632287-00-4P, Aluminum barium cerium europium oxide ($Al0.02BaCe0.8Eu0.2O_3$) 632287-01-5P, Barium cerium promethium oxide ($BaCe0.8Pm0.2O_3$) 632287-02-6P, Barium cerium holmium oxide ($BaCe0.8Ho0.2O_3$) 632287-03-7P, Barium cerium thulium oxide ($BaCe0.8Tm0.2O_3$) 632287-04-8P, Barium cerium lutetium oxide ($BaCe0.8Lu0.2O_3$) 632287-05-9P, Barium cerium scandium oxide ($BaCe0.8Sc0.2O_3$) 632287-06-0P 632287-07-1P 632287-08-2P
 Barium cerium gadolinium zirconium oxide ($BaCe0.2Gd0.4Zr0.4O_3$)
 632287-09-3P, Barium cerium indium zirconium oxide
 ($BaCe0.1In0.3Zr0.6O_3$) 632287-10-6P

RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(oxygen-deficient, proton conductors; thin-film barium-transition metal oxide-rare earth oxide proton-conducting solid electrolytes for fuel cells)

- stuttgart. Schiller, Guenter; Franco, Thomas; Henne, Rudolf; Lang, Michael; Ruckdaeschel, Robert; Otschik, Peter; Eichler, Klaus (Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Stuttgart, D-70569, Germany). Proceedings - Electrochemical Society, 2001-16(Solid Oxide Fuel Cells VII), 885-894 (English) 2001. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.
- AB A review (12 refs.). The planar **metallic substrate supported thin-film SOFC concept** developed at DLR Stuttgart on the basis of advanced plasma spray technol. ("spray concept") enables the fabrication of complete cells with a size of up to 20 + 20 cm². The electrode layers and the thin **electrolyte** with a total thickness of the MEA structure of less than 100-120 μ m are consecutively deposited onto a porous **metallic substrate** in a single time- and cost-effective spray procedure. The thin-film cells show high electrochem. performance at reduced operating **temperature** in the **temperature range** 750-800 °C. The present paper describes the current status of the DLR spray concept including fabrication technol. and scale-up aspects, recent developments with materials and components and electrochem. performance of plasma sprayed thin-film SOFC.
- CC 52-0 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 55, 56, 72, 76
- ST review SOFC metal support DLR stuttgart
- IT Coating process
(plasma spraying; status of **metallic substrate supported thin-film SOFC** at DLR stuttgart)
- IT Alloys, uses
Metals, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(porous, substrates; status of **metallic substrate supported thin-film SOFC** at DLR stuttgart)
- IT Fuel cells
(solid oxide; status of **metallic substrate supported thin-film SOFC** at DLR stuttgart)
- IT Porous materials
(substrates; status of **metallic substrate supported thin-film SOFC** at DLR stuttgart)
- L379 ANSWER 40 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:892312 Document No. 139:352742 Method for fabrication of solid polymer fuel cell. Hiroi, Osamu; Fukumoto, Hisatoshi; Yoshida, Yasuhiro; Kurata, Tetsuyuki (Mitsubishi Denki Kabushiki Kaisha, Japan). U.S. Pat. Appl. Publ. US 2003211380 A1 20031113, 10 pp. (English). CODEN: USXXCO. APPLICATION: US 2003-429944 20030506. PRIORITY: JP 2002-135831 20020510; JP 2003-104282 20030408.
- AB The invention concerns a solid polymer type fuel cell having a polyelectrolyte film having a proton conductivity; an anode and a cathode arranged on the opposite sides of the polyelectrolyte film; and a gas flow channel for supplying gas to the both electrodes, the anode and the cathode each being composed of a catalyst layer that is in contact with the polyelectrolyte film and a gas diffusion layer for allowing the diffusion of gas supplied from the gas flow channel to the catalyst layer, in which the gas diffusion layer included in the cathode electrode is constructed of a carbon-containing material and the surface of the carbon-containing material is modified to be hydrophilic.
- IC ICM H01M004-96
ICS H01M008-10; H01M004-94
- INCL 429044000; 429030000
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST Section cross-reference(s): 38
 polymer solid type fuel cell fabrication
 IT Carbon black, uses
 RL: CAT (Catalyst use); TEM (Technical or engineered material use);
 USES (Uses)
 (catalytic metal supported; method for
 fabrication of solid polymer fuel cell)
 IT Dew point
 (cathode gas; method for fabrication of solid polymer
 fuel cell)
 IT Oxides (inorganic), uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (hydrophilic coating; method for fabrication of solid
 polymer fuel cell)
 IT Coating materials
 (method for fabrication of solid polymer fuel
 cell)
 IT Carbon fibers, uses
 RL: DEV (Device component use); USES (Uses)
 (method for fabrication of solid polymer fuel
 cell)
 IT Polyesters, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (method for fabrication of solid polymer fuel
 cell)
 IT Fuel cells
 (solid electrolyte; method for fabrication of solid
 polymer fuel cell)
 IT 7631-86-9, Silica, uses 13463-67-7, Titanium oxide, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (coating; method for fabrication of solid polymer
 fuel cell)
 IT 7440-06-4, Platinum, uses 12779-05-4
 RL: CAT (Catalyst use); USES (Uses)
 (method for fabrication of solid polymer fuel
 cell)
 IT 25038-59-9, Polyethylene terephthalate, uses 322012-68-0, TGP-H
 090
 RL: TEM (Technical or engineered material use); USES (Uses)
 (method for fabrication of solid polymer fuel
 cell)

L379 ANSWER 41 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:872494 Document No. 139:367512 Fuel cell with
 solid electrolytic membrane and catalyst electrode for
 improved cell characteristic and reliability. Imai, Hideto;
 Yoshitake, Tsutomu; Shimakawa, Yuichi; Shinko, Takashi; Nakamura,
 Arata; Kimura, Hidekazu; Kuroshima, Sadanori; Kubo, Yoshimi (NEC
 Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2003317736 A2 20031107, 12
 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-117954
 20020419.

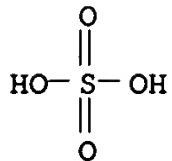
AB Fuel cell has fuel electrode, to which
 liquid fuel is supplied, oxidizer electrode and a solid
 electrolyte membrane sandwiched between the fuel electrode
 and the oxidizer electrode, wherein a layer containing H₂-containing oxoacid
 salt is formed between the fuel electrode or oxidizer
 electrode and the solid electrolyte membrane, optionally
 the solid electrolyte membrane contains the H₂-containing
 oxoacid salt. The catalyst electrode comprises a
 substrate, a catalyst layer formed on the substrate, and a layer
 containing H₂-containing oxoacid layer. In the fuel cell
 , the proton conductivity is satisfactorily maintained
 and the penetration and crossover of liquid fuel are suppressed to
 improve cell characteristics and reliability.

IT 7789-16-4, Cesium bisulfate
 RL: TEM (Technical or engineered material use); USES (Uses)

(fuel cell with solid electrolytic membrane and catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

RN 7789-16-4 HCAPLUS

CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

IT 7440-05-3, Palladium, uses

RL: TEM (Technical or engineered material use); USES (Uses)
 (liquid fuel permeation-preventing layer containing; fuel cell with solid electrolytic membrane and catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M008-02

ICS C01B019-00; H01M004-86; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST fuel cell hydrogen contg oxyacid salt

IT Fuel cell electrodes

(catalytic; fuel cell with solid electrolytic membrane and catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

IT Fuel cells

Solid electrolytes

(fuel cell with solid electrolytic membrane and catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

IT Zeolites (synthetic), uses

RL: TEM (Technical or engineered material use); USES (Uses)
 (liquid fuel permeation-preventing layer containing; fuel cell with solid electrolytic membrane and catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

IT Fuels

(liquid; fuel cell with solid electrolytic membrane and catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

IT 7789-16-4, Cesium bisulfate 120635-35-0 133883-65-5

620970-69-6 620970-70-9 620970-73-2

RL: TEM (Technical or engineered material use); USES (Uses)

(fuel cell with solid electrolytic membrane and catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

IT 7440-05-3, Palladium, uses

RL: TEM (Technical or engineered material use); USES (Uses)
 (liquid fuel permeation-preventing layer containing; fuel cell with solid electrolytic membrane and

catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

L379 ANSWER 42 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:872490 Document No. 139:367511 Manufacture of gas-diffusion electrode for manufacture of solid polymer fuel cell. Tanuma, Toshihiro; Kinoshita, Shinji (Asahi Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003317727 A2 20031107, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-124436 20020425.

- AB The electrode which is placed next to an ion-exchange membrane and contains carbon-supported metal catalysts and F-containing ion-exchange resins, is manufactured by (1) mixing the catalysts with the ion-exchange resins in liquid to satisfy WF/WC ratio ≥ 0.01 and < 0.05 (WF = weight of the resins; WC = weight of C in the catalysts) to give a dispersion A having dispersed $\leq 1.0 \mu\text{m}$ -catalyst particle ratio to total catalyst particles ≥ 20 volume%, (2) adding the resins to the dispersion A to give a dispersion B satisfying WF/WC ratio 0.5-1.7, and (3) coating with the dispersion B. The electrode formed on the ion-exchange membrane surface is porous, conductive, water-repellent, and durable and gives the cell with high power and durability.
- IC ICM H01M004-88
 ICS H01M004-86; H01M008-02; H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38
- ST solid polymer fuel cell gas diffusion electrode;
 metal carbon catalyst fuel cell
 electrode; ion exchange fluoropolymer fuel
 cell electrode
- IT Ion exchangers
 (F-containing; manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)
- IT Fuel cell electrodes
 (gas diffusion; manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)
- IT Catalysts
 (manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)
- IT Carbon black, uses
 RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)
- IT Fluoropolymers, uses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)
- IT 158191-37-8, Flemion S
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (ion-exchange membrane, electrode formed on; manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)
- IT 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses
 RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical,

engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

IT 31175-20-9
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

L379 ANSWER 43 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:830687 Document No. 140:148997 On the use of Pd filters on proton conducting SOFC ceramics.
 Schober, T. (IFF, Forschungszentrum Juelich, Juelich, 52425, Germany). Ionics, 9(3 & 4), 297-300 (English) 2003. CODEN: IONIFA. ISSN: 0947-7047. Publisher: Institute for Ionics.

AB Ceramic proton conductors are materials which conduct protons under an applied elec. field and permit the construction of a SOFC in analogy to the oxygen ion conductor 8YSZ. Such protonic ceramic fuel cells have been labeled PCFCs to distinguish them from the standard SOFCs. PCFCs have several advantages when compared with standard SOFCs. First, there is no water contamination of the fuel gas. Second, the protonic conductivity may be higher in the intermediate temperature range (550-700°C). Also, the activation energy for proton migration is much lower than that of oxygen ion conduction. In addition, internal reforming is also possible permitting the use of natural gas. An intriguing possibility is the use of palladium filters on the fuel side which only permit the diffusion of protons to the filter-electrolyte interface. This may reduce undesirable mixing of the fuel and the oxygen on either side of the electrolyte. In this work, it is shown that the entry of protons from the Pd into the ceramic conductor is straight forward. Prototype test PCFCs are shown to operate as required. To test the Pd-ceramic proton conductor system a study was undertaken using Pd tubes which were coated with thin layers of the proton conducting ceramics. When flushing the tube insides with H₂ and exposing the outsides to air, Nernst voltages of such electrochem. cells could be recorded as a function of temperature. The present rather preliminary work, however, was hampered by leakage of the thin film HTPC (high temperature proton conductor). Thus, the theor. Nernst voltages were not attained.

IT 191980-68-4, Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O_{8.73})
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(BCN18; Pd filters in proton conducting SOFC ceramics)

RN 191980-68-4 HCAPLUS
 CN Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O_{8.73}) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	8.73	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

IT 7440-05-3, Palladium, uses 37197-23-2
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (Pd filters in proton conducting SOFC ceramics)
 RN 7440-05-3 HCPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 37197-23-2 HCPLUS
 CN Silver alloy, base, Ag 70,Pd 30 (9CI) (CA INDEX NAME)

Component	Component	Component
Percent	Registry Number	
Ag	70	7440-22-4
Pd	30	7440-05-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 57, 76

ST proton conducting solid oxide fuel cell; palladium filter proton conducting SOFC

IT Electric conductors, ceramic
 Electric potential
 Perovskite-type crystals
 (Pd filters in proton conducting SOFC ceramics)

IT Ionic conductivity
 (proton; Pd filters in proton conducting SOFC ceramics)

IT Fuel cells
 (solid oxide; Pd filters in proton conducting SOFC ceramics)

IT 191980-68-4, Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O_{8.73})
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (BCN18; Pd filters in proton conducting SOFC ceramics)

IT 1333-74-0, Hydrogen, uses
 RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (Pd filters in proton conducting SOFC ceramics)

IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 37197-23-2 142107-79-7D, Calcium indium zirconium oxide (CaIn_{0.1}Zr_{0.9}O₃), oxygen-depleted 403694-09-7, 8YSZ 653573-09-2D, Barium cerium yttrium zirconium oxide (BaCe_{0.05}Y_{0.15}Zr_{0.8}O₃), oxygen-depleted
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (Pd filters in proton conducting SOFC ceramics)

L379 ANSWER 44 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2003:763604 Document No. 140:79659 Differential resistance analysis of protonic ceramic fuel cells for measuring bulk conductivity. Coors, W. Grover; Zhong, Dalong (Protonetics International Inc., Golden, CO, USA). Solid State Ionics, 162-163, 283-290 (English) 2003.
 CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..
 AB A technique, called differential resistance anal., was developed to

determine the bulk conductivity of protonic ceramic electrolyte in hydrogen/air fuel cells under load. For these expts., identical specimens of the protonic ceramic BaCe_{0.9}Y_{0.1}O_{3- α} (BCY10) were prepared with thicknesses of 240, 560, 790, and 1150 μm with thin film platinum electrodes. The current-voltage (I-V) characteristic curves for each specimen were obtained between 600 and 800°, and the slope of each I-V curve was determined in the ohmic region between 10 and 20 mA, giving the total effective area specific resistance (ASR cell) of the cell under load as a function of temperature. The bulk electrolyte resistivity was found by taking the difference in resistance of two cells divided by the difference in electrolyte thickness. The bulk conductivity of the electrolyte measured at 1000 K by this technique was 5 mS/cm or less, depending on the overall electrolyte thickness, much lower than the values obtained by impedance spectroscopy. Also, the activation energy for bulk conduction was higher than expected for pure protonic transport. This paper attempts to correlate the two measurement techniques and explain the apparent discrepancies.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L379 ANSWER 45 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:763550 Document No. 140:184546 Synthesis and characterisation of cermet anodes for SOFCs with a proton-conducting ceramic phase. Mather, G. C.; Figueiredo, F. M.; Jurado, J. R.; Frade, J. R. (Camino de Valdelatas s/n, Instituto de Ceramica y Vidrio, CSIC, Madrid, 28049, Spain). Solid State Ionics, 162-163, 115-120 (English) 2003. CODEN: SSIOD3. ISSN: 0167-2738.

Publisher: Elsevier Science B.V..

AB Cermet anodes of Ni-CaZr_{0.95}Y_{0.05}O_{2.975} (Ni-CZY) and Ni-SrZr_{0.95}Y_{0.05}O_{2.975} (Ni-SZY) were synthesized by combustion followed by sintering and reduction to Ni metal. The anodes were co-compressed and co-sintered on green YSZ electrolyte to produce anode/electrolyte/anode assemblies with planar electrodes of thickness, apprx. 150 μm . The anode microstructures are composed of a uniform and homogeneous distribution of submicron Ni metal and ceramic phases. Preliminary impedance spectroscopy results on sym. cells indicate that the polarization resistance is composed of two or more pH₂O-sensitive contributions and is dependent on the composition of the proton-conducting ceramic.

IT 162824-28-4P, Strontium yttrium zirconium oxide (SrY_{0.05}Zr_{0.95}O_{2.98})

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); USES (Uses) (sintered anode cermet with nickel; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)

RN 162824-28-4 HCAPLUS

CN Strontium yttrium zirconium oxide (SrY_{0.05}Zr_{0.95}O_{2.98}) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	2.98	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72, 75, 76

ST cermet anode SOFCs proton conducting
 ceramic SEM XRD impedance; nickel zirconium calcium yttrium

- IT strontium oxide conductance orthorhombic perovskite
- IT Electric impedance
 - (of fuel cells; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT Polarization resistance
 - (on sym. fuel cells; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT Crystal structure types
 - (orthorhombic; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT Electrodes
 - (planar, for fuel cells; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT Ionic conductivity
 - (proton; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT Fuel cells
 - (solid oxide; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT Cermets
 - Combustion synthesis
 - Electric conductors, ceramic
 - Fuel cell anodes
 - Microstructure
 - Reduction
 - Sintering
 - (synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 114168-16-0, TZ-8Y
 - RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 - (YSZ, cermet anodes attached to; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 57-13-6, Urea, reactions
 - RL: RCT (Reactant); RACT (Reactant or reagent)
 - (combustion fuel; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 1313-99-1, Nickel oxide (NiO), uses
 - RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 - (phase in anode cermet before reduction; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 12036-39-4P, Strontium zirconium oxide (SrZrO₃)
 - RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 - (phase in anode cermet; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 162824-28-4P, Strontium yttrium zirconium oxide (SrY_{0.05}Zr_{0.95}O_{2.98}) 657398-56-6P, Calcium yttrium zirconium oxide (CaY_{0.05}Zr_{0.95}O_{2.98})
 - RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); USES (Uses)
 - (sintered anode cermet with nickel; synthesis and

- characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
IT 64417-98-7, Yttrium zirconium oxide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 7440-02-0P, Nickel, uses
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 7732-18-5, Water, uses
RL: NUU (Other use, unclassified); USES (Uses)
(synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 1333-74-0, Hydrogen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 1314-23-4, Zirconia, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(yttria-stabilized; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)
- IT 1314-36-9, Yttria, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(zirconia stabilized by; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)

L379 ANSWER 46 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:738047 Document No. 139:248046 Method for manufacturing polymer electrolyte type fuel cell. Ueyama, Yasuhiro; Watanabe, Masaru; Kamikihara, Nobuyuki; Yasumoto, Eiichi (Matsushita Electric Industrial Co., Ltd., Japan). PCT Int. Appl. WO 2003077336 A1 20030918, 50 pp. DESIGNATED STATES: W: CA, CN, JP, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2003-JP2973 20030313. PRIORITY: JP 2002-70350 20020314.

AB A method for manufacturing a polymer electrolyte type fuel cell having a polymer electrolyte film and, arranged on both sides thereof, electrodes containing a catalyst layer and a gas diffusion layer being contacted with the polymer electrolyte film, and a separator contacted with the gas diffusion layer, characterized in that, in the formation of the catalyst layer through applying a paste containing a carbon fine powder comprising a noble metal catalyst carried on a specific support, followed by drying, the electrode is controlled to have a percentage of the surface area occupied by cracked portions below a predetd. acceptable level, through adjusting at least (1) the film thickness of the catalyst layer, (2) the type of the catalyst comprising carbon and a noble metal carried thereon and (3) the drying rate for the solvent in the paste. For example, a film thickness of 10 to 25 μm , a carbon carrying 5 to 20 wt % of platinum, and a drying rate for the solvent of 2.5 to 20

mg/cm²/ min are employed.

IC ICM H01M004-88
ICS H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST polymer electrolyte fuel cell precious
metal platinum catalyst drying

IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst support; manufacture of platinum catalyst layer
supported on carbon black for polymer electrolyte
-type fuel cell)

IT Drying
Fuel cells
(manufacture of platinum catalyst layer supported on carbon
black for polymer electrolyte-type fuel
cell)

IT 7440-06-4, Platinum, uses
RL: CAT (Catalyst use); EPR (Engineering process); PEP (Physical,
engineering or chemical process); PROC (Process); USES (Uses)
(catalyst; manufacture of platinum catalyst layer supported
on carbon black for polymer electrolyte-type
fuel cell)

L379 ANSWER 47 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:697777 Document No. 139:367423 Fuel cells

operating in the "gap" temperature regime.

Smotkin, Eugene S. (Department of Chemistry, University of Puerto Rico @ Rio Piedras, San Juan, 00931, P. R.). Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry, 48(2), 887-888 (English) 2003. CODEN: PSADFZ. ISSN: 1521-4648.

Publisher: American Chemical Society, Division of Fuel Chemistry.

AB An intermediate temperature electrolyte system
enabling fuel cell operation between 250
°C and 400°C, i.e., in the gap between a PEM
fuel cell and a molten carbonate fuel
cell (MCFC) has the benefits of enhanced ORR kinetics, CO
tolerance, and a simplified fuel processor without the materials
thermal instability problems of the high temperature systems.
Addnl., the gap temperature region enables downward
scalability for portable power, a power regime not accessible by
MCFCs. Inorg. electronically insulating proton
conductors are candidates for gap
electrolytes and a composite membrane electrolyte
was prepared by coating ammonium polyphosphate and
silica spheres on a Pd foil. A fuel cell
operating in the gap regime with this electrolyte
was demonstrated. Within the gap regime, a
water-gas-shift reactor and a PROX reactor will not be needed and
the intermediate temperature operation will permit downward
scalability for portable power.

IT 7440-05-3, Palladium, uses
RL: DEV (Device component use); USES (Uses)
(fuel cell operating at intermediate
temps. with electrolyte coated on)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST phosphoric acid silica palladium composite electrolyte
fuel cell

IT Polyphosphoric acids

IT RL: DEV (Device component use); USES (Uses)
 (ammonium salts, composite with silica,
 electrolyte; fuel cell operating at
 intermediate temps. with)

IT Fuel cell electrolytes
 Fuel cells
 (fuel cell operating at intermediate
 temps.)

IT 7631-86-9, Silica, uses
 RL: DEV (Device component use); USES (Uses)
 (composite with ammonium polyphosphate, electrolyte;
 fuel cell operating at intermediate
 temps. with)

IT 1333-74-0, Hydrogen, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (fuel cell operating at intermediate
 temps. fueled with)

IT 630-08-0, Carbon monoxide, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (fuel cell operating at intermediate
 temps. fueled with hydrogen containing)

IT 7440-05-3, Palladium, uses
 RL: DEV (Device component use); USES (Uses)
 (fuel cell operating at intermediate
 temps. with electrolyte coated on)

IT 7782-44-7, Oxygen, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); PROC (Process)
 (in fuel cell operating at intermediate
 temps.)

L379 ANSWER 48 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:677263 Document No. 140:130991 Development of low-cost
alloy supported SOFCs. Visco, Steven
 J.; Jacobson, Craig P.; Villareal, Igor; Leming, Andy; Matus, Yuriy;
 De Jonghe, Lutgard C. (Materials Sciences Division, Lawrence
 Berkeley National Laboratory, Berkeley, CA, 94720, USA).
 Proceedings - Electrochemical Society, 2003-7(Solid Oxide Fuel Cells
 VIII (SOFC VIII)), 1040-1050 (English) 2003. CODEN: PESODO. ISSN:
 0161-6374. Publisher: Electrochemical Society.

AB The LBNL group has been developing ferritic steel **supported**
 solid oxide fuel cells. The use of ferritic
 steel as a **support** for electrode **supported** solid
 oxide fuel cells greatly reduces the raw
 materials cost and improves the strength of the **thin-film**
 cells. The basic design includes the use of a high-strength FeCr
support, a thin interlayer electrode (Ni-YSZ or
 other), and a thin **electrolyte film**. The entire
 structure is fabricated through co-firing of the three
layers in a reducing environment. This paper describes the
 preliminary performance of the **metal supported**
 cells, as well as a variety of possible interlayer electrodes.

IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); TEM (Technical or engineered
 material use); USES (Uses)
 (development of low-cost **alloy supported**
SOFCs)

RN 7440-02-0 HCAPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72, 76

ST alloy support SOFC low cost
 IT Polyoxyalkylenes, uses
 Polyvinyl butyrals
 RL: NUU (Other use, unclassified); USES (Uses)
 (development of low-cost alloy supported
 SOFCs)
 IT Fuel cells
 (solid oxide; development of low-cost alloy
 supported SOFCs)
 IT Alloys, uses
 RL: DEV (Device component use); TEM (Technical or engineered
 material use); USES (Uses)
 (supports; development of low-cost alloy
 supported SOFCs)
 IT 1313-99-1, Nickel oxide NiO, uses 7440-02-0,
 Nickel, uses 7440-06-4, Platinum, uses 12017-94-6,
 Chromium lanthanum oxide (CrLaO₃) 12060-59-2,
 Strontium titanium oxide (SrTiO₃) 12597-68-1, Stainless
 steel, uses 148595-66-8, Cobalt iron lanthanum
 strontium oxide (Co0.2Fe0.8La0.6Sr0.4O₃) 254760-18-4,
 Lanthanum strontium titanium oxide
 (La0.65Sr0.35TiO₃) 403694-09-7, 8YSZ 439900-64-8, Cobalt
 strontium titanium yttrium oxide
 (Co0.05Sr0.85Ti0.95Y0.1O₃) 649758-60-1
 RL: DEV (Device component use); TEM (Technical or engineered
 material use); USES (Uses)
 (development of low-cost alloy supported
 SOFCs)
 IT 57-11-4, Stearic acid, uses 67-63-0, 2-Propanol, uses
 25322-68-3, PEG
 RL: NUU (Other use, unclassified); USES (Uses)
 (development of low-cost alloy supported
 SOFCs)
 IT 11100-60-0, Steel, chromium, uses
 RL: DEV (Device component use); TEM (Technical or engineered
 material use); USES (Uses)
 (ferritic; development of low-cost alloy
 supported SOFCs)

L379 ANSWER 49 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:677189 Document No. 140:18256 Improvement of LSM cathode for high
 power density SOFCs. Wang, Wei Guo; Barfod, Rasmus; Larsen, Peter
 Halvor; Kammer, Kent; Bentzen, Janet J.; Hendriksen, Peter Vang;
 Mogensen, Mogens (Materials Research Department, Riso National
 Laboratory, Roskilde, DK-4000, Den.). Proceedings - Electrochemical
 Society, 2003-7(Solid Oxide Fuel Cells VIII (SOFC VIII)), 400-408
 (English) 2003. CODEN: PESODO. ISSN: 0161-6374. Publisher:
 Electrochemical Society.

AB Optimization of processing (La_{1-x}Sr_x)_yMnO_{3±δ} composite
 cathodes led to high-performance SOFCs. Sym. cells were
 prepared with (La_{1-x}Sr_x)_yMnO_{3±δ} composite cathodes on
 yttria-stabilized zirconia tapes. A homogeneous microstructure with
 submicron pores was obtained that resulted in a low area-
 specific polarization resistance of 0.09 at
 850° and 0.31 Ω·cm² at 750°, while
 area-specific series resistances were
 0.29 and 0.61 Ω·cm², resp., in a sym. cell with a
 yttria-stabilized zirconia tape 185 .μm thick.
 The low area-specific polarization and series resistance are
 attributed to long triple-phase boundaries and good adhesion between
 cathode and electrolyte. Impedance measurements indicated
 an activation energy of the cathode of 1.26 eV. Anode-
 supported cells with an active area of 4+4 cm² show a
 high power d. of 1.44 W/cm² at 850° and 0.8 W/cm² at
 750° at a cell voltage of 0.7 V.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L379 ANSWER 50 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:677168 Document No. 140:18253 Characterization of cathode supported thin film electrolytes. Becker, M.; Weber, A.; Mueller, A. C.; Ivers-Tiffey, E. (Institut fuer Werkstoffe, Institut fuer Werkstoffe der Elektrotechnik Universitaet Karlsruhe, Adenauerring 20, Karlsruhe, 76131, Germany). Proceedings - Electrochemical Society, 2003-7(Solid Oxide Fuel Cells VIII (SOFC VIII)), 222-228 (English) 2003. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB The lower operating temperature limit of SOFCs is governed by the thermally activated conductance of the electrolyte as well as by the polarization resistance of the electrodes. For operating temps. lower than 800 degree.C, supported thin film electrolytes can be applied to reduce the ohmic losses within a single cell. In this work, cathode supported thin film electrolytes from state-of-the-art ceria and zirconia electrolyte powders were realized using mass production technologies. The conductivity of the electrolyte thin film was determined by impedance spectroscopy and the microstructure was characterized by electron microscopy methods (SEM). The conductivity of the electrolyte thin film (thickness < 10 .mu.m) depends on grain size and porosity. The conductivity values of state-of- the-art electrolyte substrates (thickness > 150 .mu.m) have not been achieved so far. However, the contribution of the electrolyte thin film to the area specific resistance is significantly smaller compared to the ASR of an electrolyte supported single cell.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 57, 76

ST cathode supported thin film oxide

electrolytes SOFC

IT Cathodes

Electrolytes

Films

(cathode supported thin film electrolytes)

IT Grain size

Porosity

(effect on elec. conductivity of cathode supported thin film oxide electrolytes for SOFC's)

IT Electric conductivity

Electric impedance

Microstructure

(of cathode supported thin film oxide electrolytes for SOFC's)

IT Fuel cells

(solid oxide; cathode supported thin film electrolytes for)

IT 1306-38-3, Ceria, uses

RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
 (gadolinia doped; cathode supported thin film electrolytes for SOFC's)

IT 157975-54-7, Lanthanum manganese strontium oxide La0.75MnSr0.203

RL: DEV (Device component use); USES (Uses)
 (thin film oxide electrolytes for SOFC's supported on cathode)

IT 1314-23-4, Zirconia, uses

RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
 (yttria doped; cathode supported thin film electrolytes for SOFC's)

" temperature regime. Smotkin, Eugene S. (Department of Chemistry, University of Puerto Rico, San Juan, 00931, P. R.). Abstracts of Papers, 226th ACS National Meeting, New York, NY, United States, September 7-11, 2003, FUEL-177. American Chemical Society: Washington, D. C. (English) 2003. CODEN: 69EKY9.

AB An intermediate temperature electrolyte system enabling fuel cell operation at 250°C to 400°C (i.e. in the gap between the PEM fuel cell and the MCFC) has the benefits of enhanced ORR kinetics, CO tolerance, and a simplified fuel processor without the materials thermal instability problems of the high temperature systems. We report the first demonstration of a fuel cell operating in the gap regime. The innovation is a support structure that enables the use of very thin inorg. electronically insulating proton conductors (EIPCs). The composite electrolyte system is based on an EIPC supported on a thin metal hydride membrane that is strong, flexible, and has excellent hydrogen transport properties. The metal hydride is coated on one or both sides with a thin film of the inorg. EIPC. By themselves, neither the metal hydride foil nor the EIPC can make an acceptable fuel cell membrane. The metal alone, being an electronic conductor, would short circuit the cathode and anode; the EIPC alone has poor mech. properties and may also be fuel-permeable. Together, the two components form an electronically insulating, mech. strong, fuel impermeable thin membrane that is ideally suited to the intermediate temperature regime.

L379 ANSWER 52 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:581659 Document No. 139:397834 Metal-Supported Solid Oxide Fuel Cells. Villarreal, I.; Jacobson, C.; Leming, A.; Matus, Y.; Visco, S.; De Jonghe, L. (Ikerlan Technological Research Center, Parque Tecnologico de Alava, Alava, Minano Menor, 01510, Spain). Electrochemical and Solid-State Letters, 6(9), A178-A179 (English) 2003. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

AB Low-cost, colloidal deposition methods were used to produce novel solid oxide fuel cell (SOFC) structures on metal alloy support electrodes. Yttria-stabilized zirconia (YSZ) films were deposited on Fe-chrome supports on top of a thin Ni/YSZ catalytic layer and sintered at 1350° in a reducing atmospheric Dense, 20 .mu.m YSZ electrolyte films were obtained on highly porous stainless steel substrates. Metal-supported fuel cells were tested at 800 and 900°, achieving power densities of over 200 mW/cm² at 900° using Pt paste cathodes. The cells showed excellent resistance to thermal cycling, and open up a low-cost path to SOFC commercialization.

IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); USES (Uses)
 (steel coated with; metal-supported
 solid oxide fuel cells with)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST stainless steel support anode solid oxide fuel cell

- IT Fuel cell anodes
(metal-supported solid oxide fuel cells)
- IT Fuel cells
(solid oxide; metal-supported solid oxide fuel cells)
- IT 7440-06-4, Platinum, uses
RL: DEV (Device component use); USES (Uses)
(cathode containing; metal-supported solid oxide fuel cells with)
- IT 115135-47-2, Cobalt iron lanthanum strontium oxide (Co0.8Fe0.2La0.6Sr0.4O3)
RL: DEV (Device component use); USES (Uses)
(cathode; metal-supported solid oxide fuel cells with)
- IT 11109-78-7
RL: DEV (Device component use); USES (Uses)
(nickel- and yttria-stabilized zirconia-coated; metal-supported solid oxide fuel cells with)
- IT 7440-02-0, Nickel, uses 64417-98-7, Yttrium zirconium oxide
RL: DEV (Device component use); USES (Uses)
(steel coated with; metal-supported solid oxide fuel cells with)
- IT 1314-23-4, Zirconium oxide (ZrO₂), uses
RL: DEV (Device component use); USES (Uses)
(yttria-doped; metal-supported solid oxide fuel cells with)
- IT 1314-36-9, Yttrium oxide (Y₂O₃), uses
RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)
(zirconia doped with; metal-supported solid oxide fuel cells with)

L379 ANSWER 53 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:560619 Document No. 139:294488 Fe-based catalysts for the reduction of oxygen in polymer electrolyte membrane fuel cell conditions: determination of the amount of peroxide released during electroreduction and its influence on the stability of the catalysts. Lefevre, Michel; Dodelet, Jean-Pol (INRS-Energie et Matériaux, Varennes, 1020, Can.). *Electrochimica Acta*, 48(19), 2749-2760 (English) 2003. CODEN: ELCAAV. ISSN: 0013-4686. Publisher: Elsevier Science B.V..

AB Fe-based catalysts have been prepared by pyrolyzing ClFeTMPP (Cl-Fe tetramethoxyphenyl porphyrin) or Fe acetate adsorbed on PTCDA (perylene tetracarboxylic dianhydride) or on prepyrolyzed PTCDA (p-PTCDA). The catalysts which were already well characterized in terms of active FeN₄/C and FeN₂/C catalytic sites (*J. Phys. Chemical B* 106 (2002) 8705) are now characterized by RRDE expts. to determine the values of the apparent number of electron transferred (n) and the percentage of peroxide (%H₂O₂) released during the oxygen reduction reaction (ORR) in H₂SO₄ at pH 1. A direct correlation is found between the relative abundance of the FeN₂/C catalytic site in these materials, their catalytic activity and the value of n. The correlation is inverse for %H₂O₂. The best catalysts at their maximum catalytic activity are characterized by n>3.9 and %H₂O₂<5%, equivalent to a value of %H₂O₂ released by a 2 weight% Pt/C catalyst. It is shown that even low peroxide levels of the order of 5 vol% in H₂SO₄ are able to decompose the catalytic sites releasing iron ions in the H₂SO₄ solution. The loss of catalytic activity correlates directly with the loss of iron ions by these catalysts. All the catalysts have been tested at the cathode of single membrane electrode assemblies (MEAs). The slow decrease in performance in fuel cell stability tests is interpreted as the result of the detrimental effect that has H₂O₂,

- released during ORR, on the chemical integrity of the nonnoble metal catalytic sites at work at the fuel cell cathodes.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 29, 67, 72
- IT Fuel cells
Polymer electrolytes
(Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT Electric potential
(effect on H₂O₂ formation on Fe-based catalysts in polymer electrolyte membrane fuel cell)
- IT Catalysts
(electrocatalysts; Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT Electrolytic cells
(membrane; Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT Surface analysis
(of Fe-based catalysts in polymer electrolyte membrane fuel cell)
- IT Electrolytic polarization
(of Fe-based catalysts in polymer electrolyte membrane fuel cell conditions in H₂SO₄ solution)
- IT Reduction, electrochemical
(of oxygen in polymer electrolyte membrane fuel cell conditions on Fe-based catalysts)
- IT Thermal decomposition
(preparation of Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell by)
- IT Electrodes
(rotating disk electrodes; reduction of oxygen on Fe-based catalysts in polymer electrolyte membrane fuel cell on stability of the catalysts)
- IT 37191-17-6
RL: CAT (Catalyst use); USES (Uses)
(Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT 7782-44-7, Oxygen, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT 128-69-8, Perylene tetracarboxylic dianhydride
RL: NUU (Other use, unclassified); USES (Uses)
(bare and prepyrolyzed; reduction of oxygen in polymer electrolyte membrane fuel cell on iron acetate adsorbed on)
- IT 7439-89-6, Iron, uses
RL: CAT (Catalyst use); USES (Uses)
(containing; Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT 7722-84-1, Hydrogen peroxide, processes
RL: CPS (Chemical process); FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); FORM (Formation, nonpreparative); PROC (Process)
(formation by oxygen reduction on Fe-based catalysts in polymer electrolyte membrane fuel cell conditions)
- IT 7664-93-9, Sulfuric acid, uses

RL: NUU (Other use, unclassified); USES (Uses)
 (oxygen reduction on Fe-based catalysts in polymer
 electrolyte membrane fuel cell
 conditions in solution containing)

IT 2140-52-5, Iron acetate
 RL: CAT (Catalyst use); USES (Uses)
 (reduction of oxygen in polymer electrolyte membrane
 fuel cell on iron acetate adsorbed on perylene
 tetracarboxylic dianhydride)

IT 7440-44-0, Carbon, uses
 RL: DEV (Device component use); MSC (Miscellaneous); USES (Uses)
 (support for Fe-based catalysts in polymer
 electrolyte membrane fuel cell)

L379 ANSWER 54 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:531579 Document No. 139:103729 Manufacture of solid polymer-type
 fuel cell and manufacture of gas diffusion electrode. Tanuma,
 Toshihiro; Kinoshita, Shinji; Shimoda, Hiroshi (Asahi Glass Co.,
 Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003197205 A2 20030711, 6
 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-393246
 20011226.

AB The invention relates to a gas diffusion electrode of a solid
 polymer-type fuel cell which is disposed
 adjacent to an ion-exchange membrane and contains a
 catalyst and a F-based ion-exchange resin and a
 metal supported on carbon. The catalyst (Wc) and
 the ion exchange resin (Wf) are mixed and dispersed in a
 liquid to form a solution (A) at a weight ratio $0.05 \leq Wf/Wr \leq 0.5$
 so that the catalyst particle with $\leq 1 \text{ }\mu\text{m}$
 occupies ≥ 30 volume% in the particle size distribution. The
 ion-exchange resin is added to the solution (A) so as to
 satisfy $Wf/Wc = 0.7-1.7$ to form a solution (B). The solution (B) is used
 to form the gas diffusion electrode. The process was able to form
 the gas diffusion electrode having high durability.

IC ICM H01M004-88
 ICS H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 67

ST solid polymer fuel cell gas diffusion electrode;
 ion exchange resin catalysts fuel cell

IT Carbon black, uses

RL: CAT (Catalyst use); USES (Uses)
 (catalyst support; gas diffusion electrode of solid
 polymer-type fuel cell)

IT Catalysts
 Fuel cell cathodes
 Ion exchangers
 (gas diffusion electrode of solid polymer-type fuel
 cell)

L379 ANSWER 55 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:521059 Document No. 139:119789 Metal/ceria water-gas
 shift catalysts for automotive polymer electrolyte
 fuel cell systems. Myers, Deborah J.; Krebs, John
 F.; Carter, J. David; Kumar, Romesh; Krumpelt, Michael (Chemical
 Technology Division, Argonne National Laboratory, Argonne, IL,
 60439-4837, USA). Pre-Print Archive - American Institute of
 Chemical Engineers, [Spring National Meeting], New Orleans, LA,
 United States, Mar. 11-14, 2002, 2308-2312. American Institute of
 Chemical Engineers: New York, N. Y. (English) 2002. CODEN: 69DXU5.

AB Several doped ceria catalysts were tested on their activity to
 promote the water-gas shift (WGS) reaction. A Pt/doped
 ceria/ γ -alumina catalyst was found that had a WGS activity
 comparable to the com. Cu/ZnO catalyst, and unlike other
 com. WGS catalysts it had not to be activated by in situ reduction, and
 showed no loss of activity upon exposure to air at 21-550°.

The catalyst showed activity in the temperature range 180-400° and could be used in high and low temperature shift reactions. This properties of the Pt/doped ceria catalyst made it suitable for fuel processing in mobile applications, but the high costs of the catalysts might prohibit their use in light duty vehicles.

IT 7440-05-3, Palladium, uses
 RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
 (dopant; metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 67

ST was gas shift catalyst ceria fuel cell hydrogen

IT Electric vehicles
 (automobiles; metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

IT Automobiles
 (elec.; metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

IT Surface area
 Water gas shift reaction catalysts
 (metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

IT Fuel cells
 (polymer-electrolyte; metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

IT Fuel gas manufacturing
 (water gas manufacturing; metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses 7440-48-4, Cobalt, uses
 RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
 (dopant; metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

IT 1306-38-3, Ceria, uses 117655-32-0, Cerium gadolinium oxide (Ce0.8Gd0.2O1.9) 197149-44-3, Cerium samarium oxide (Ce0.85Sm0.15O1.92) 461412-51-1, Cerium praseodymium zirconium oxide (Ce0.8Pr0.02Zr0.17O1.99) 461412-52-2, Cerium yttrium zirconium oxide (Ce0.8Y0.1Zr0.1O1.95) 461412-53-3, Cerium gadolinium zirconium oxide (Ce0.8Gd0.02Zr0.17O1.99)
 RL: CAT (Catalyst use); USES (Uses)
 (metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

IT 1333-74-0P, Hydrogen, preparation
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (metal/ceria water-gas shift catalysts for automotive polymer electrolyte fuel cell systems)

IT 1344-28-1, Alumina, uses
 RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)

(support; metal/ceria water-gas shift
catalysts for automotive polymer electrolyte
fuel cell systems)

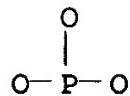
L379 ANSWER 56 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:435140 Document No. 139:9315 Solid acid electrolytes for
electrochemical devices. Haile, Sossina M.; Chisholm, Calum; Merle,
Ryan B.; Boysen, Dane A.; Narayanan, Sekharipuram R. (USA). U.S.
Pat. Appl. Publ. US 2003104258 A1 20030605, 29 pp., Cont.-in-part of
U.S. 6,468,684. (English). CODEN: USXXCO. APPLICATION: US
2002-211882 20020801. PRIORITY: US 1999-PV116741 19990122; US
1999-PV146946 19990802; US 1999-PV151811 19990830; US 1999-439377
19991115.

AB Improved solid acid electrolyte materials, methods of synthesizing
such materials, and electrochem. devices incorporating such
materials are provided. The stable electrolyte material comprises a
solid acid capable undergoing rotational disorder of oxyanion groups
and capable of extended operation at elevated temps.,
i.e., solid acids having hydrogen bonded anion groups; a
superprotic, trigonal, tetragonal, or cubic, disordered phase; and
capable of being operating at temps. of .apprx.100°
and higher.

IT 13569-78-3P, Cesium phosphite (CsH₂PO₃)
RL: DEV (Device component use); SPN (Synthetic preparation); PREP
(Preparation); USES (Uses)
(solid acid electrolytes for electrochem. devices)

RN 13569-78-3 HCAPLUS

CN Phosphonic acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



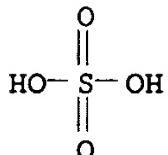
● Cs

ONE OR MORE TAUTOMERIC DOUBLE BONDS NOT DISPLAYED IN THE STRUCTURE

IC ICM H01M008-10
ICS H01M006-18; C01B025-30; C01B025-45
INCL 429033000; 423306000; 423307000; 429304000; 429321000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 72, 76
ST electrolyte solid acid electrochem device; fuel
cell electrolyte solid acid; capacitor
electrolyte solid acid; sensor electrolyte solid
acid; hydrogen sepn membrane electrolyte solid acid
IT Conducting polymers
Electrolytic capacitors
Fuel cell electrolytes
Ion exchange
Sensors
Solid electrolytes
(solid acid electrolytes for electrochem. devices)
IT 13569-78-3P, Cesium phosphite (CsH₂PO₃) 22021-54-1P,
Barium hydrogen silicate BaH₂SiO₄ 22112-04-5P, Calcium sodium
hydrogen silicate CaNaHSiO₄ 42035-64-3P 60746-55-6P, Strontium
germanate(IV) (SrH₂GeO₄)
RL: DEV (Device component use); SPN (Synthetic preparation); PREP
(Preparation); USES (Uses)
(solid acid electrolytes for electrochem. devices)

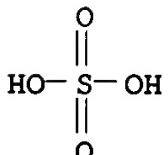
L379 ANSWER 57 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:253809 Document No. 138:404193 Stability of the dry

- proton conductor CsHSO₄ in hydrogen atmosphere.
 Yang, B.; Kannan, A. M.; Manthiram, A. (Materials Science and Engineering Program, The University of Texas at Austin, Austin, TX, 78712, USA). Materials Research Bulletin, 38(4), 691-698 (English) 2003. CODEN: MRBUAC. ISSN: 0025-5408. Publisher: Elsevier Science Inc..
- AB** The suitability of the dry proton conductor, CsHSO₄ as an electrolyte for fuel cells, was assessed by studying its chemical stability in a H₂ atmosphere in the presence of the electrocatalyst, Pt/C. X-ray diffraction and differential scanning calorimetric (DSC) data indicate that CsHSO₄ decomp. to Cs₂SO₄ and H₂S at 150° in a H₂ atmosphere when it is mixed with Pt/C catalyst but, it is stable under identical conditions in the absence of the Pt/C catalyst. Although thin composite membranes (.apprx.80 μm) prepared with poly(vinylidene fluoride) and CsHSO₄ exhibit high p conductivity at 150-200°, which is adequate for fuel cell applications, development of compatible non-platinum alloys or transition metal oxide catalysts is needed before CsHSO₄ can be used as an electrolyte in fuel cells. Processing procedures must be optimized to obtain dense, gas-impermeable membranes suitable for fuel cell application.
- IT** 10294-54-9, Cesium sulfate (Cs₂SO₄)
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 (decomposition of dry proton conductor, cesium bisulfate, in hydrogen atmospheric)
- RN** 10294-54-9 HCAPLUS
CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



●2 Cs

- IT** 7789-16-4, Cesium sulfate (CsHSO₄)
 RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 (stability of dry proton conductor, cesium bisulfate, in hydrogen atmospheric)
- RN** 7789-16-4 HCAPLUS
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

- CC** 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 76
- ST** cesium bisulfate proton conductor stability
 hydrogen fuel cell electrolyte;
 fuel cell membrane polyvinylidene fluoride cesium

- bisulfate
 - IT Fuel cell separators
 (fabrication of fuel cell membrane by casting
 slurry of poly(vinylidene fluoride) and cesium bisulfate)
 IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses)
 (fabrication of fuel cell membrane by casting
 slurry of poly(vinylidene fluoride) and cesium bisulfate)
 IT Ionic conductors
 (protonic; stability of dry proton
 conductor, cesium bisulfate, in hydrogen atmospheric)
 IT Fuel cell electrolytes
 (stability of dry proton conductor, cesium
 bisulfate, in hydrogen atmospheric)
 IT 7783-06-4, Hydrogen sulfide (H₂S), formation (nonpreparative)
 10294-54-9, Cesium sulfate (Cs₂SO₄)
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 (decomposition of dry proton conductor, cesium
 bisulfate, in hydrogen atmospheric)
 IT 24937-79-9, Poly(vinylidene fluoride)
 RL: DEV (Device component use); USES (Uses)
 (fabrication of fuel cell membrane by casting
 slurry of poly(vinylidene fluoride) and cesium bisulfate)
 IT 7789-16-4, Cesium sulfate (CsHSO₄)
 RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or
 reagent); USES (Uses)
 (stability of dry proton conductor, cesium
 bisulfate, in hydrogen atmospheric)
 IT 1333-74-0, Hydrogen, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (stability of dry proton conductor, cesium
 bisulfate, in hydrogen atmospheric)
 IT 7440-06-4, Platinum, uses
 RL: CAT (Catalyst use); USES (Uses)
 (stability of dry proton conductor, cesium
 bisulfate, in hydrogen atmospheric with)
 IT 7440-44-0, Carbon, uses
 RL: CAT (Catalyst use); USES (Uses)
 (support; stability of dry proton
 conductor, cesium bisulfate, in hydrogen atmospheric with)

L379 ANSWER 58 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:200697 Document No. 138:240574 Structure of electrochemical
 reaction baseplate. Yo, Ko-Shen; Tsai, Min-Chieh; Wu, Ja-Lin; Luo,
 Lei-Hsi (Industrial Technology Research Institute, Taiwan). Jpn.
 Kokai Tokkyo Koho JP 2003077489 A2 20030314, 5 pp. (Japanese).
 CODEN: JKXXAF. APPLICATION: JP 2001-256664 20010827.

AB The title baseplate has high functionality and is suited for use in manufacturing of fuel cell, electrochem. reactor, or detector. The baseplate is made of a plate material having multiple ditches of a desired width/depth ratio, multiple though-holes of desired dimension formed on the baseplate, electrolysis layer formed on the surface the inside though-holes, a selective insulation layer formed on the electrolysis layer, a porous elec. conductive layer formed on the insulation layer, and a catalyst layer formed on the conductive layer. The double layered material is formed by sandwiching a selective insulation layer with a pair of baseplates.
 IT 7440-05-3, Palladium, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (structure of electrochem. reaction baseplate for manufacturing of fuel cell, electrochem. reactor, or detector)
 RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

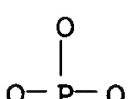
IC ICM H01M008-02
 ICS C25B009-10; C25B011-03; H01M004-86
 CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 76
 IT Electrolytic cells
 Fuel cells
 Sensors
 (structure of electrochem. reaction baseplate for manufacturing of
 fuel cell, electrochem. reactor, or detector)
 IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses
 7440-42-8, Boron, uses 7440-57-5, Gold, uses 7782-40-3, Diamond,
 uses 7782-42-5, Graphite, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (structure of electrochem. reaction baseplate for manufacturing of fuel
 cell, electrochem. reactor, or detector)

L379 ANSWER 59 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:118173 Document No. 138:156301 Method of synthesis of solid acid
 electrolytes for electrochemical devices. Haile, Sossina M.;
 Chisholm, Calum; Merle, Ryan B.; Boysen, Dane; Narayanan,
 Sekharipuram R. (California Institute of Technology, USA). PCT Int.
 Appl. WO 2003012894 A2 20030213, 51 pp. DESIGNATED STATES: W: AE,
 AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR,
 CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,
 ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV,
 MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD,
 SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA,
 ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI,
 FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG,
 TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-US24564
 20020801. PRIORITY: US 2001-PV309807 20010801; US 2002-PV355362
 20020206.

AB Improved solid acid electrolyte materials, methods of synthesizing
 such materials, and electrochem. devices incorporating such
 materials are disclosed. The stable electrolyte material comprises
 a solid acid capable undergoing rotational disorder of oxyanion
 groups and capable of extended operation at elevated temps
 ., i.e., solid acids having hydrogen bonded anion groups; a
 superprotic, trigonal, tetragonal, or cubic, disordered phase; and
 capable of being operating at temps. of .apprx.100°
 and higher.

IT 13569-78-3P
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
 preparation); PREP (Preparation); USES (Uses)
 (method of synthesis of solid acid electrolytes for electrochem.
 devices)

RN 13569-78-3 HCAPLUS
 CN Phosphonic acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

ONE OR MORE TAUTOMERIC DOUBLE BONDS NOT DISPLAYED IN THE STRUCTURE

IC ICM H01M
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49, 72, 76

ST fuel cell solid acid electrolyte
 synthesis; electrochem device solid acid electrolyte
 synthesis

IT Glass, uses
 Metals, uses
 Polymers, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (binder; method of synthesis of solid acid electrolytes for
 electrochem. devices)

IT Battery electrolytes
 Conducting polymers
 Electric conductivity
 Fuel cell electrolytes
 Ion exchange
 Membranes, nonbiological
 Solid electrolytes
 (method of synthesis of solid acid electrolytes for
 electrochem. devices)

IT Ionic conductivity
 (proton; method of synthesis of solid acid electrolytes
 for electrochem. devices)

IT 67-56-1, Methanol, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (fuel cell; method of synthesis of solid acid
 electrolytes for electrochem. devices)

IT 13569-78-3P 22021-54-1P, Barium hydrogen silicate BaH₂SiO₄
 22112-04-5P, Calcium sodium hydrogen silicate CaNaHSiO₄
 22112-05-6P 28263-33-4P 42035-64-3P, Silicic acid (H₄SiO₄),
 disodium salt, pentahydrate 60746-55-6P
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
 preparation); PREP (Preparation); USES (Uses)
 (method of synthesis of solid acid electrolytes for electrochem.
 devices)

L379 ANSWER 60 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:36428 Document No. 138:89590 Method for preparation of
 hydrogenated fullerene by hydrogenation of fullerene using
 ruthenium, palladium, iridium, platinum, or cobalt
 supported on activated alumina. Ozaki, Toshihiko; Tai,
 Yutaka (National Institute of Advanced Industrial Science and
 Technology, Japan). Jpn. Kokai Tokkyo Koho JP 2003012572 A2
 20030115, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
 2001-191005 20010625.

AB Hydrogenated fullerene is prepared by conversion of C₆₀ fullerene into
 from C₆₀H₁₈ to C₆₀H₃₆ under mild hydrogenation conditions using one
 of Ru, Pd, Ir, Pt, and Co metal
 supported on an activated alumina. Also claimed is a method
 for storage of hydrogen by above conversion of C₆₀ fullerene into
 from C₆₀H₁₈ to C₆₀H₃₆. The hydrogenation catalyst is prepared by
 impregnation of activated alumina in an aqueous solution of metal
 salt selected from ruthenium chloride, palladium
 chloride, iridium chloride, platinum chloride, and cobalt nitrate,
 evaporation of water, drying, and firing at 400-800°. The
 catalyst obtained is hydrogenated at 400-800° under hydrogen
 atmospheric before its use. This process highly efficiently gives in high
 yield with high selectivity and without decomposition, hydrogenated
 fullerene which is useful as light-weight hydrogen storage material
 with higher hydrogen storage ratio (.apprx.2.4 weight % and .apprx.4.8
 weight% C₆₀H₁₈ and C₆₀H₃₆, resp.) as compared to metal-based
 hydrogen storage material (e.g. 1.4 weight% for LaNi₅H₆) and may find
 an application for fuel cell automobile. Thus,
 50 mg C₆₀ fullerene and 10 weight% Co/10 g activated alumina in 200 mL
 toluene were hydrogenated in an autoclave at 150° for 300 min
 to give a mixture of hydrogenated C₆₀ fullerene containing from C₆₀H₁₈ to
 C₆₀H₃₆ with 100% conversion ratio.

IT 7440-05-3D, Palladium, supported on

activated alumina
 RL: CAT (Catalyst use); USES (Uses)
 (preparation of hydrogenated fullerene as hydrogen storage material by
 hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
 supported on activated alumina)
 RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C07C013-64
 ICS B01J023-42; B01J023-44; B01J023-46; B01J023-75; B01J037-02;
 B01J037-08; B01J037-18; C07C005-02; C07B061-00
 CC 25-29 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)
 ST hydrogenated fullerene prepn hydrogen storage material; fullerene
 hydrogenation; ruthenium supported activated alumina
 hydrogenation catalyst; palladium supported
 activated alumina hydrogenation catalyst; iridium supported
 activated alumina hydrogenation catalyst; platinum supported
 activated alumina hydrogenation catalyst; cobalt supported
 activated alumina hydrogenation catalyst
 IT Fullerenes
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (hydrogenated; preparation of hydrogenated fullerene as hydrogen
 storage material by hydrogenation of fullerene using Ru,
 Pd, Ir, Pt, or Co supported on activated
 alumina)
 IT Hydrogenation
 Hydrogenation catalysts
 (preparation of hydrogenated fullerene as hydrogen storage material by
 hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
 supported on activated alumina)
 IT 1344-28-1, Alumina, uses
 RL: CAT (Catalyst use); USES (Uses)
 (activated, catalyst support; preparation of hydrogenated
 fullerene as hydrogen storage material by hydrogenation of
 fullerene using Ru, Pd, Ir, Pt, or Co supported
 on activated alumina)
 IT 7439-88-5D, Iridium, supported on activated alumina
7440-05-3D, Palladium, supported on
 activated alumina 7440-06-4D, Platinum, supported on
 activated alumina 7440-18-8D, Ruthenium, supported on
 activated alumina 7440-48-4D, Cobalt, supported on
 activated alumina
 RL: CAT (Catalyst use); USES (Uses)
 (preparation of hydrogenated fullerene as hydrogen storage material by
 hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
 supported on activated alumina)
 IT 1333-74-0, Hydrogen, reactions 7647-10-1, Palladium
 chloride 10025-83-9, Iridium chloride 10049-08-8, Ruthenium
 chloride 10141-05-6, Cobalt nitrate 12648-47-4, Platinum
 chloride 99685-96-8, C60 Fullerene
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (preparation of hydrogenated fullerene as hydrogen storage material by
 hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
 supported on activated alumina)
 IT 99685-96-8DP, C60 Fullerene, hydrogenated 130797-14-7P,
 Octadecahydrofullerene-C60 130797-17-0P,
 Hexatriacontahydrofullerene-C60
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of hydrogenated fullerene as hydrogen storage material by
 hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
 supported on activated alumina)

L379 ANSWER 61 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:35310 Document No. 138:58968 Hydrogen generation via methane cracking for integrated heat and electricity production using a fuel cell. Sioui, Daniel R.; Towler, Gavin P.; Oroskar, Anil R.; Zhou, Lubo; Dunne, Stephen R.; Kulprathipanja, Santi; Galperin, Leonid B.; Modica, Frank S.; Voskoboinikov, Timur V. (UOP LLC, USA). U.S. US 6506510 B1 20030114, 14 pp. (English). CODEN: USXXAM.

APPLICATION: US 2000-737990 20001215.

AB A novel integrated system for the co-production of heat and electricity for residences or com. buildings is based on the cracking of hydrocarbons to generate hydrogen for a fuel cell. Compared to prior art reforming methods for hydrogen production, the cracking reaction provides an input stream to the fuel cell that is essentially free of CO, a known poison to the anode catalyst in many fuel cell designs, such as PEM fuel cells. The cracking reaction is coupled with an air or steam regeneration cycle to reactivate that cracking catalyst for further use. This regeneration can provide a valuable source of heat or furnace fuel to the system. A novel control method for system adjusts the durations of the cracking and regeneration cycles to optimize the recovery of reaction heat.

IT 7440-05-3, Palladium, uses 12735-99-8

RL: TEM (Technical or engineered material use); USES (Uses)
 (H-permeable membrane; hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 12735-99-8 HCAPLUS

CN Silver alloy, nonbase, Ag,Pd (9CI) (CA INDEX NAME)

Component	Component Registry Number
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Ag	7440-22-4
Pd	7440-05-3

IT 7439-89-6, Iron, uses 7440-02-0,

Nickel, uses

RL: CAT (Catalyst use); USES (Uses)
 (hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)

RN 7439-89-6 HCAPLUS

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IT 7440-32-6, Titanium, uses

RL: TEM (Technical or engineered material use); USES (Uses)
 (hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)

RN 7440-32-6 HCAPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IT 7440-62-2, Vanadium, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (support; hydrogen generation via methane cracking for
 integrated heat and electricity production using fuel cell)
 RN 7440-62-2 HCAPLUS
 CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM H01M008-04
 ICS H01M008-12; H01M002-14
 INCL 429017000; 429026000; 429039000
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology).
 Section cross-reference(s): 49
 IT Hydrides
 RL: FMU (Formation, unclassified); TEM (Technical or engineered
 material use); FORM (Formation, nonpreparative); USES (Uses)
 (hydrogen generation via methane cracking for integrated heat and
 electricity production using fuel cell)
 IT Fuel cells
 (solid electrolyte; hydrogen generation via methane
 cracking for integrated heat and electricity production using
 fuel cell)
 IT Clays, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (support; hydrogen generation via methane cracking for
 integrated heat and electricity production using fuel cell)
 IT 7440-05-3, Palladium, uses 12735-99-8
 71174-06-6 93977-71-0
 RL: TEM (Technical or engineered material use); USES (Uses)
 (H-permeable membrane; hydrogen generation via methane cracking
 for integrated heat and electricity production using fuel cell)
 IT 1302-88-1, Cordierite 1309-48-4, Magnesia, uses 7439-89-6
 , Iron, uses 7440-02-0, Nickel, uses
 RL: CAT (Catalyst use); USES (Uses)
 (hydrogen generation via methane cracking for integrated heat and
 electricity production using fuel cell)
 IT 7440-32-6, Titanium, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (hydrogen generation via methane cracking for integrated heat and
 electricity production using fuel cell)
 IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 7440-03-1,
 Niobium, uses 7440-25-7, Tantalum, uses 7440-62-2,
 Vanadium, uses 7440-67-7, Zirconium, uses 7631-86-9,
 Silica, uses 12597-68-1, Stainless steel, uses 13463-67-7,
 Titania, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (support; hydrogen generation via methane cracking for
 integrated heat and electricity production using fuel cell)

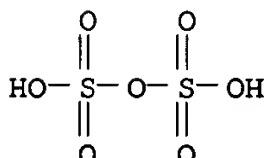
L379 ANSWER 62 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2002:902388 Document No. 138:124940 Instability of Sulfate and
 Selenate Solid Acids in Fuel Cell Environments.
 Merle, Ryan B.; Chisholm, Calum R. I.; Boysen, Dane A.; Haile,
 Sossina M. (California Institute of Technology Materials Science,
 Pasadena, CA, 91125, USA). Energy & Fuels, 17(1), 210-215 (English)
 2003. CODEN: ENFUEM. ISSN: 0887-0624. Publisher: American
 Chemical Society.
 AB The chemical and thermal stability of several solid acid compds. under
 fuel cell operating conditions was investigated,

primarily by thermogravimetric methods. Thermal decomposition of CsHSO₄, a material which has shown promise as an alternative electrolyte for proton exchange membrane (PEM) fuel cells, initiates decomposition at apprx.175° under inert conditions. The overall decomposition process can be expressed as 2CsHSO₄ → Cs₂SO₄ + H₂O + SO₃, with Cs₂S₂O₇ appearing as an intermediate byproduct at slow heating rates. Under reducing conditions, chemical decomposition can occur via reaction with hydrogen according to 2CsHSO₄ + 4H₂ → Cs₂SO₄ + 4H₂O + H₂S. In the absence of fuel cell catalysts, this reduction reaction is slow; however, materials such as Pt, Pd, and WC are highly effective in catalyzing the reduction of sulfur and the generation of H₂S. In the case of M₃H(XO₄)₂ compds. (M = Cs, NH₄, or Rb; X = S or Se), a similar reduction reaction occurs: 2M₃H(XO₄)₂ + 4H₂ → 3M₂XO₄ + 4H₂O + H₂X. In an operational fuel cell based on CsHSO₄, performance degraded with time, presumably as a result of H₂S poisoning of the anode catalyst. The performance loss was recoverable by exposure of the fuel cell to air at 160°.

IT 50992-48-8P, Disulfuric acid, dicesium salt
 RL: BYP (Byproduct); FMU (Formation, unclassified); FORM (Formation, nonpreparative); PREP (Preparation)
 (formation of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)

RN 50992-48-8 HCPLUS

CN Disulfuric acid, dicesium salt (9CI) (CA INDEX NAME)

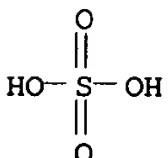


●2 Cs

IT 10294-54-9, Cesium sulfate
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 (formation of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)

RN 10294-54-9 HCPLUS

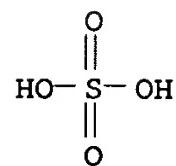
CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



●2 Cs

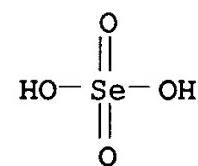
IT 7789-16-4, Cesium hydrogen sulfate 63317-98-6
 RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 (fuel cell electrolyte; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane

fuel cells)
 RN 7789-16-4 HCPLUS
 CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 63317-98-6 HCPLUS
 CN Selenic acid, ammonium salt (2:3) (9CI) (CA INDEX NAME)



● 3/2 NH₃

IT 7440-05-3, Palladium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (thermal decomposition catalyst; instability of alkali metal
 and ammonium bisulfates and biselenates as solid acid
electrolytes in proton-exchange-membrane fuel
 cells)
 RN 7440-05-3 HCPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 78
 ST fuel cell cesium bisulfate solid acid
 electrolyte; hydrogen sulfide poisoning fuel
 cell anode sulfate decompn; alkali metal bisulfate
 solid acid fuel cell electrolyte
 IT Acids, uses
 RL: DEV (Device component use); NUU (Other use, unclassified); USES
 (Uses)
 (inorg., solid; instability of alkali metal and
 ammonium bisulfates and biselenates as solid acid
electrolytes in proton-exchange-membrane fuel
 cells)
 IT Fuel cell electrolytes
 Fuel cell separators
 (instability of alkali metal and ammonium bisulfates
 and biselenates as solid acid **electrolytes** in
 proton-exchange-membrane fuel cells)
 IT Thermal decomposition
 (of inorg. solid acids; instability of alkali metal and
 ammonium bisulfates and biselenates as solid acid
electrolytes in proton-exchange-membrane fuel

- cells)
- IT Battery anodes
 - (slow poisoning of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 50992-48-8P, Disulfuric acid, dicesium salt
 - RL: BYP (Byproduct); FMU (Formation, unclassified); FORM (Formation, nonpreparative); PREP (Preparation)
 - (formation of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 7446-11-9, Sulfur trioxide, formation (nonpreparative) 7783-06-4, Hydrogen sulfide, formation (nonpreparative) 10294-54-9, Cesium sulfate
 - RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 - (formation of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 7789-16-4, Cesium hydrogen sulfate 13775-30-9
 - 63317-98-6 71555-62-9 231277-45-5, Cesium phosphate sulfate ($Cs_2(H_2PO_4)(HSO_4)$)
 - RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 - (fuel cell electrolyte; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 7664-93-9D, Sulfuric acid, alkali metal hydrogen and ammonium hydrogen salts 7783-08-6D, Selenic acid, alkali metal hydrogen and ammonium hydrogen salts
 - RL: DEV (Device component use); NUU (Other use, unclassified); USES (Uses)
 - (fuel cell electrolytes; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 12070-12-1, Tungsten carbide (WC)
 - RL: CAT (Catalyst use); USES (Uses)
 - (thermal decomposition catalyst; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)

L379 ANSWER 63 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2002:886578 Document No. 137:387085 Porous metal support for cell stack and cell plate for solid oxide fuel cell. Shibata, Itaru; Yamanaka, Mitsugu; Sato, Fumitoshi; Hatano, Shoji; Kushibiki, Keiko; Hara, Naoki; Fukuzawa, Tatsuhiro; Uchiyama, Makoto (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2002334706 A2 20021122, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-137049 20010508.

- AB The title support is equipped with a porous metal body for connecting to a cell stack and a reinforcement made of a material having resistance to oxidation and reduction. The title cell plate is equipped with the above support connected to an anode layer or a cathode layer of the fuel cell. The support has high strength and thermal deformation resistance.
- IT 7440-02-0, Nickel, uses 7440-22-4, Silver, uses
 - RL: TEM (Technical or engineered material use); USES (Uses)
 - (reinforced porous metal support for cell stack and cell plate for solid oxide fuel cell)

RN 7440-02-0 HCPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-22-4 HCPLUS
 CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT 12735-99-8
 RL: TEM (Technical or engineered material use); USES (Uses)
 (reinforcement; reinforced porous metal support
 for cell stack and cell plate for solid oxide fuel
 cell)

RN 12735-99-8 HCPLUS
 CN Silver alloy, nonbase, Ag,Pd (9CI) (CA INDEX NAME)

Component	Component
Registry Number	
Ag	7440-22-4
Pd	7440-05-3

IC ICM H01M008-02
 ICS H01M008-02; H01M008-12
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST porous metal support reinforcement solid oxide
 fuel cell
 IT Fuel cells
 (solid electrolyte; reinforced porous metal
 support for cell stack and cell plate for solid oxide
 fuel cell)
 IT 7440-02-0, Nickel, uses 7440-22-4,
 Silver, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (reinforced porous metal support for cell
 stack and cell plate for solid oxide fuel cell
)
 IT 11101-13-6 11101-28-3 11105-45-6 12606-02-9, Inconel
 12649-48-8 12728-71-1 12735-99-8 66174-72-9
 175783-53-6
 RL: TEM (Technical or engineered material use); USES (Uses)
 (reinforcement; reinforced porous metal support
 for cell stack and cell plate for solid oxide fuel
 cell)

L379 ANSWER 64 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2002:849988 Document No. 137:355431 Metal-supported
 solid electrolyte electrochemical cell and multi-cell reactors
 incorporating same. Tunney, Cathal Joseph; Roy, Robert Donald;
 McClure, Fraser (3825892 Canada Inc., Can.; Alberta Research Council
 Inc.). PCT Int. Appl. WO 2002089243 A2 20021107, 61 pp. DESIGNATED
 STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA,
 CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE,
 GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
 LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL,
 PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG,
 US, UZ, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM,
 CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL,
 PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO
 2002-CA582 20020426. PRIORITY: US 2001-2001/PV28685U 20010427; US

2001-2001/PV30302U 20010703; US 2001-2001/PV326561 20011002.

AB The invention provides a **metal-supported solid electrolyte electrochem. cell**, multi cell reactor assemblies incorporating a plurality of such cells, and processes of forming the electrochem. cells. In one embodiment, the electrochem. cell includes a central electrolyte membrane, first and second perforated **metallic layers** adhered to each of the major surfaces of the central electrolyte membrane, and first and second outer, non-porous electrolyte **layers** formed above the **metallic layers**. In another embodiment, first and second inner, porous electrolyte **layers** are sandwiched on either side of the central membrane, between the first and second **metallic layers**. The electrochem. cell is thus generally formed from ceramic material as thin layers supported on non-porous, robust **metallic layers**, designed to behave as though made of metal. Preferably, the electrochem. cell includes metallurgically bonded elec. interconnects and/or gas seals.

IT 7440-02-0, Nickel, uses 7440-05-3,
Palladium, uses 7440-22-4, Silver, uses
7440-47-3, Chromium, uses
RL: DEV (Device component use); USES (Uses)
(**metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)

RN 7440-02-0 HCPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-47-3 HCPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

IC ICM H01M008-12
ICS H01M008-24; B01D053-32; B01J019-00; C01B003-38
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 48, 49, 55, 72
ST electrochem cell **metal supported solid electrolyte**; fuel cell metal supported solid electrolyte; oxygen concn cell metal supported solid electrolyte; reactor multiple cell **metal supported solid electrolyte**
IT Sol-gel processing
(coating; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)

- IT Brazing
 - (inert atmospheric; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Electric contacts
 - Electrodeposition
 - Electron beam evaporation
 - Interconnections, electric
 - Oxidation catalysts
 - Perovskite-type crystals
 - Photolithography
 - Reactors
 - Reforming catalysts
 - Seals (parts)
 - Sputtering
 - (**metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Oxides (inorganic), uses
 - Rare earth metals, uses
 - RL: CAT (Catalyst use); USES (Uses)
 - (**metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Hydrocarbons, processes
 - RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 - (**metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Oxidation
 - (partial, cell; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Etching
 - (photochem.; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Fuel gas manufacturing
 - (reforming; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Coating process
 - (sol-gel; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Fuel cells
 - (solid electrolyte; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Alloys, uses
 - RL: DEV (Device component use); USES (Uses)
 - (super alloys, Ni-bases; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Brazing
 - (vacuum; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT Nickel alloy, base
 - RL: DEV (Device component use); USES (Uses)
 - (superalloy; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT 7782-44-7P, Oxygen, preparation
 - RL: PUR (Purification or recovery); PREP (Preparation)
 - (concentration cell; **metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same**)
- IT 1304-76-3, Bismuth oxide, uses 1306-38-3, Ceria, uses
 - RL: DEV (Device component use); USES (Uses)
 - (doped; **metal-supported solid electrolyte**)

electrochem. cell and multi-cell reactors incorporating same)
 IT 7705-08-0, Ferric chloride, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 (etchant; metal-supported solid electrolyte
 electrochem. cell and multi-cell reactors incorporating same)
 IT 12597-68-1, Stainless steel, uses
 RL: DEV (Device component use); USES (Uses)
 (ferritic; metal-supported solid electrolyte
 electrochem. cell and multi-cell reactors incorporating same)
 IT 57285-40-2, Chromium lanthanum strontium oxide
 RL: CAT (Catalyst use); USES (Uses)
 (metal-supported solid electrolyte
 electrochem. cell and multi-cell reactors incorporating same)
 IT 1314-23-4, Zirconia, uses 7440-02-0, Nickel,
 uses 7440-05-3, Palladium, uses 7440-06-4,
 Platinum, uses 7440-22-4, Silver, uses
 7440-47-3, Chromium, uses 7440-57-5, Gold, uses
 11122-73-9 20667-12-3, Silver oxide 55575-02-5, Cerium
 gadolinium oxide 94076-32-1, Haynes 230
 RL: DEV (Device component use); USES (Uses)
 (metal-supported solid electrolyte
 electrochem. cell and multi-cell reactors incorporating same)
 IT 1314-36-9, Yttria, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (zirconia stabilized with, coating; metal-supported solid electrolyte electrochem. cell and
 multi-cell reactors incorporating same)

L379 ANSWER 65 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2002:719422 Document No. 138:109502 Temperature-Dependence
 of Methanol Oxidation Rates at PtRu and Pt Electrodes. Wakabayashi,
 Noriaki; Uchida, Hiroyuki; Watanabe, Masahiro (Clean Energy Research
 Center, Yamanashi University, Takeda 4, Kofu, 400-8511, Japan).
 Electrochemical and Solid-State Letters, 5(11), E62-E65 (English)
 2002. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical
 Society.

AB High temperature operation of direct methanol fuel
 cells is essential from the viewpoint of achieving a high
 performance with reduced amts. of Pt electrocatalysts used. A
 thin-layer flow cell of 0.1 mm gap is applied to evaluate
 the activity of PtRu (46 atom % Ru) alloy and Pt electrodes for
 methanol oxidation reaction (MOR) in a wide temperature range from
 20 to 120° in 1 M MeOH + 0.1 M HClO₄ solution under pressurized
 operation. The steady electrocatalytic activity could be evaluated
 by linear potential-sweep voltammetry under a certain
 electrolyte flow rate (> 0.2 mL/s), which eliminated an
 effect of the oxidation current of hydrogen evolved at the proximate
 counter cathode. Onset potentials [vs. reversible hydrogen
 electrode (RHE)] for the MOR shifted linearly to less pos.
 potentials with elevating temperature, e.g., from 0.45 V (at
 20°) to 0.34 V (at 120°) on the PtRu electrode and
 from 0.66 to 0.52 V on the Pt electrode, resp. A low apparent
 activation energy of 16 kJ/mol for the MOR was found on PtRu at 0.45
 to 0.55 V, which was smaller than that of 24 kJ/mol on Pt at 0.70 V.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST methanol oxidn electrochem cell platinum ruthenium electrode

temp effect

IT Oxidation kinetics

(electrochem.; temperature-dependence of methanol oxidation
 rates at PtRu alloy and Pt electrodes)

IT Surface roughness

(of Pt and PtRu electrodes; temperature-dependence of
 methanol oxidation rates at PtRu alloy and Pt electrodes)

IT Cyclic voltammetry

Electric current-potential relationship

Fuel cell electrodes
 Linear-sweep voltammetry
 Overvoltage
 Oxidation, electrochemical
 (temperature-dependence of methanol oxidation rates at PtRu
 alloy and Pt electrodes)

IT Electrochemical cells
 (thin-layer flow; temperature-dependence of methanol oxidation
 rates at PtRu alloy and Pt electrodes)

IT 7601-90-3, Perchloric acid, uses
 RL: DEV (Device component use); PRP (Properties); TEM (Technical or
 engineered material use); USES (Uses)
 (aqueous solution, electrolyte; temperature-dependence of methanol
 oxidation rates at PtRu alloy and Pt electrodes)

IT 7440-57-5, Gold, uses
 RL: DEV (Device component use); PEP (Physical, engineering or
 chemical process); PYP (Physical process); TEM (Technical or
 engineered material use); PROC (Process); USES (Uses)
 (disk, electrode support; temperature-dependence of
 methanol oxidation rates at PtRu alloy and Pt electrodes)

IT 7440-06-4, Platinum, uses 488118-24-7
 RL: CAT (Catalyst use); DEV (Device component use); PRP
 (Properties); USES (Uses)
 (sputter-coated electrode; temperature-dependence of methanol
 oxidation rates at PtRu alloy and Pt electrodes)

IT 67-56-1, Methanol, uses
 RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or
 reagent); USES (Uses)
 (temperature-dependence of methanol oxidation rates at PtRu
 alloy and Pt electrodes)

IT 124-38-9, Carbon dioxide, formation (nonpreparative)
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 (temperature-dependence of methanol oxidation rates at PtRu
 alloy and Pt electrodes)

IT 1333-74-0P, Hydrogen, preparation
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (temperature-dependence of methanol oxidation rates at PtRu
 alloy and Pt electrodes)

L379 ANSWER 66 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2002:268457 Document No. 136:281515 Steam reforming method for
 producing hydrogen-rich gas without supplying external heat.
 Kaneko, Tomoko; Yoshida, Noriko; Yamashita, Toshio; Kawasaki,
 Terufumi (Hitachi Ltd., Japan; Babcock-Hitachi K. K.). Jpn. Kokai
 Tokkyo Koho JP 2002104808 A2 20020410, 7 pp. (Japanese). CODEN:
 JKXXAF. APPLICATION: JP 2000-299102 20000927.

AB A source gas containing O (or air), hydrocarbons, and steam is brought
 in contact with a catalyst for simultaneously accelerating the
 oxidation reaction and steam-reforming reaction of the hydrocarbons.
 The catalyst comprises Pd, Pt, Ru, or Rh, optionally with
 Ni, Co, Fe, Ag, Cu, Zn,
 Cr, and/or rare earth metals supported
 on a porous carrier comprising Al-containing oxide. In the catalyst,
 amts. of the active elements for accelerating the reactions are
 regulated for balancing the exothermic heat from the oxidation reaction
 and the endothermic heat from the steam-reforming reaction, so that
 the temperature of the whole catalyst can be kept at a desired
 temperature without supplying heat from the exterior.

IT 7439-91-0, Lanthanum, uses
 RL: CAT (Catalyst use); USES (Uses)
 (carrier; steam reforming method for producing H-rich gas by
 using catalyst without supplying external heat)

RN 7439-91-0 HCAPLUS
 CN Lanthanum (8CI, 9CI) (CA INDEX NAME)

La

IT 7440-02-0, Nickel, uses 7440-05-3,
 Palladium, uses 7440-22-4, Silver, uses
 7440-47-3, Chromium, uses 7440-50-8,
 Copper, uses
 RL: CAT (Catalyst use); USES (Uses)
 (steam reforming method for producing H-rich gas by using
 catalyst without supplying external heat)

RN 7440-02-0 HCPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-47-3 HCPLUS

CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C01B003-40
 ICS B01J023-10; B01J032-00; C01B003-48; H01M008-06; H01M008-10
 CC 49-1 (Industrial Inorganic Chemicals)
 Section cross-reference(s): 52
 ST steam reforming catalyst temp control hydrogen prodn
 IT Fuel cells
 (solid electrolyte; steam reforming method for
 producing H-rich gas by using catalyst without supplying external
 heat)
 IT Rare earth metals, uses
 RL: CAT (Catalyst use); USES (Uses)
 (steam reforming method for producing H-rich gas by using
 catalyst without supplying external heat)
 IT 1302-88-1, Cordierite 1302-93-8, Mullite 1344-28-1, Alumina,
 uses 7439-91-0, Lanthanum, uses
 RL: CAT (Catalyst use); USES (Uses)
 (carrier; steam reforming method for producing H-rich gas by
 using catalyst without supplying external heat)
 IT 7439-89-6, Iron, uses 7440-02-0, Nickel
 , uses 7440-05-3, Palladium, uses 7440-06-4,
 Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium,

uses 7440-22-4, Silver, uses 7440-47-3
 , Chromium, uses 7440-48-4, Cobalt, uses
 7440-50-8, Copper, uses 7440-66-6, Zinc, uses
 RL: CAT (Catalyst use); USES (Uses)
 (steam reforming method for producing H-rich gas by using
 catalyst without supplying external heat)

L379 ANSWER 67 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2002:199509 Document No. 137:9494 Ceramic-based materials for
 electrochemical applications. Linkov, V.; Petrik, L.; Vaivars, G.;
 Maluleke, A.; Gericke, G. (Inorganic Porous Media Group, University
 of the Western Cape, Bellville, S. Afr.). Macromolecular Symposia,
 178(Polymer Characterization and Materials Science), 153-168
 (English) 2002. CODEN: MSYMEC. ISSN: 1022-1360. Publisher:
 Wiley-VCH Verlag GmbH.

AB A review. Novel catalytic ceramic-based materials that simultaneously possess high **surface area** and adsorptive capacity, with proton and/or electron conducting properties, were developed for electrocatalytic and waste-stream treatment processes. These novel inorg. **proton conducting** membranes were produced by incorporating inorg. **low-temperature proton conductors** such as polymeric phosphates of polyvalent metals into the porous structure of different active or inert substrates such as ceramics (in the form of tubes, disks and paper), zeolites or carbon cloth. Electrocatalytic activity was obtained by coating **electroconductive surface** layers that acted both as electrode and catalyst. Bench scale and pilot scale test reactors were built and commissioned. Comparison with existing technologies was undertaken for several applications. Such high **surface-area inorg. materials** that support nanoscale metal clusters are being tested as electrode materials in anodic oxidation, inorg. **fuel cells** and hydrogen generation.

CC 57-0 (Ceramics)

ST Section cross-reference(s): 52, 60, 72

review ceramic membrane **proton conducting**
 wastewater treatment phenol oxidn; ceramic membrane **proton**
conducting fuel cell separator review

IT Fuel cell separators

(ceramic-based materials for electrochem. applications)

IT Ceramic membranes

(**proton-conducting**; ceramic-based materials
 for electrochem. applications)

L379 ANSWER 68 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2002:107738 Document No. 136:153925 Hydrogen permeable membrane for
 use in **fuel cells**, and partial reformatte

fuel cell system having reforming catalysts in the
 anode **fuel cell** compartment. Smotkin, Eugene S.

(Nuvant Systems, LLC, USA). PCT Int. Appl. WO 2002011226 A2

20020207, 58 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ,
 BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ,
 EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
 KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
 MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR,
 TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW; RW: AT, BE, BF, BJ, CF, CG,
 CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML,
 MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2.

APPLICATION: WO 2001-US20032 20010622. PRIORITY: US 2000-PV222128
 20000731; US 2000-PV244208 20001031.

AB An electronically insulating **proton conductor** is
 adhered or deposited as a film on a dense phase proton permeable
 material in a thickness such that the composite C/D has a
proton conductivity in a preferred intermediate
 temperature range of 175-550°. The composite C/D is
 incorporated in a high **temperature electrolyte**

membrane electrolyte assembly (MEA), which is incorporated into a fuel cell that can operate in this intermediate temperature range. The fuel cell in turn is incorporated into a fuel cell system having a fuel reformer in the flow field of a fuel mixture entering the fuel cell or in a mode where the fuel cell receives fuel from an external reformer.

IT 7440-02-0, Nickel, uses 7440-05-3,
 Palladium, uses 7440-32-6, Titanium,
 uses 7440-62-2, Vanadium, uses
 12023-04-0, Feti 12196-72-4
 18649-05-3, Cesium Dihydrogen phosphate 153328-13-3D
 , Strontium yttrium zirconium oxide SrY0.1Zr0.9O3, O-deficient
 191980-68-4, Barium calcium niobium oxide
 $Ba_3Ca_1.18Nb_1.82O_8.73$ 251566-28-6, Lanthanum
 magnesium scandium strontium oxide La0.9Mg0.1Sc0.9Sr0.1O3
 395656-87-8D, Barium cerium gadolinium zirconium oxide
 $(BaCe0.5-0.9Gd0.1Zr0-0.4O3)$, O-deficient 395656-88-9
 RL: DEV (Device component use); USES (Uses)
 (hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)

RN 7440-02-0 HCPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-32-6 HCPLUS
 CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-62-2 HCPLUS
 CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

RN 12023-04-0 HCPLUS
 CN Iron, compd. with titanium (1:1) (8CI, 9CI) (CA INDEX NAME)

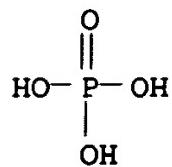
Component	Ratio	Component Registry Number
Ti	1	7440-32-6
Fe	1	7439-89-6

RN 12196-72-4 HCPLUS
 CN Lanthanum, compd. with nickel (1:5) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component
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		Registry Number
Ni	5	7440-02-0
La	1	7439-91-0

RN 18649-05-3 HCAPLUS
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 153328-13-3 HCAPLUS
CN Strontium yttrium zirconium oxide (SrY0.1Zr0.903) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.9	7440-67-7
Y	0.1	7440-65-5
Sr	1	7440-24-6

RN 191980-68-4 HCAPLUS
CN Barium calcium niobium oxide ($\text{Ba}_3\text{Ca}_{1.18}\text{Nb}_{1.82}\text{O}_{8.73}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	8.73	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

RN 251566-28-6 HCAPLUS
CN Lanthanum magnesium scandium strontium oxide ($\text{La}_{0.9}\text{Mg}_{0.1}\text{Sc}_{0.9}\text{Sr}_{0.103}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Sr	0.1	7440-24-6
Sc	0.9	7440-20-2
Mg	0.1	7439-95-4
La	0.9	7439-91-0

RN 395656-87-8 HCAPLUS
CN Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.5-0.9}\text{Gd}_{0.1}\text{Zr}_{0-0.403}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0 - 0.4	7440-67-7

Gd	0.1	7440-54-2
Ce	0.5 - 0.9	7440-45-1
Ba	1	7440-39-3

RN 395656-88-9 HCAPLUS
 CN Vanadium alloy, base, V 66,Cr 34 (9CI) (CA INDEX NAME)

Component	Component	Component
Percent	Registry Number	
V	66	7440-62-2
Cr	34	7440-47-3

IC ICM H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST fuel cell hydrogen permeable membrane; reforming
 catalyst anode fuel cell compartment
 IT Electric conductors
 Fuel cell anodes
 Fuel cell electrolytes
 Fuel cells
 Membranes, nonbiological
 Reforming catalysts
 Synthesis gas manufacturing
 Water gas shift reaction
 (hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)
 IT Polyphosphates
 RL: DEV (Device component use); USES (Uses)
 (hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)
 IT Hydrides
 RL: TEM (Technical or engineered material use); USES (Uses)
 (hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)
 IT Ionic conductors
 (protonic; hydrogen permeable membrane for use in
 fuel cells and partial reformate fuel
 cell system having reforming catalysts in anode
 fuel cell compartment)
 IT Fuel gas manufacturing
 (reforming; hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)
 IT Palladium alloy, base
 RL: DEV (Device component use); USES (Uses)
 (hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)
 IT 7440-02-0, Nickel, uses 7440-05-3,
 Palladium, uses 7440-32-6, Titanium,
 uses 7440-62-2, Vanadium, uses
 12023-04-0, Feti 12196-72-4
 18649-05-3, Cesium Dihydrogen phosphate 153328-13-3D
 , Strontium yttrium zirconium oxide SrY0.1Zr0.9O3, O-deficient
 191980-68-4, Barium calcium niobium oxide
 Ba3Ca1.18Nb1.82O8.73 251566-28-6, Lanthanum
 magnesium scandium strontium oxide La0.9Mg0.1Sc0.9Sr0.1O3

395656-87-8D, Barium cerium gadolinium zirconium oxide (BaCe0.5-0.9Gd0.1Zr0-0.403), O-deficient 395656-88-9
 RL: DEV (Device component use); USES (Uses)
 (hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)

IT 1333-74-0P, Hydrogen, uses
 RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)

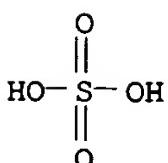
IT 67-56-1, Methanol, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (hydrogen permeable membrane for use in fuel
 cells and partial reformate fuel cell
 system having reforming catalysts in anode fuel
 cell compartment)

L379 ANSWER 69 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2001:859525 Document No. 136:121015 Approaches and technical challenges to high temperature operation of proton exchange membrane fuel cells. Yang, C.; Costamagna, P.; Srinivasan, S.; Benziger, J.; Bocarsly, A. B. (Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ, 08540, USA). Journal of Power Sources, 103(1), 1-9 (English) 2001. CODEN: JPSODZ. ISSN: 0378-7753.

Publisher: Elsevier Science B.V..
 AB Water loss and the coincident increase in membrane resistance to proton conduction are significant barriers to high performance operation of traditional proton exchange membrane fuel cells at elevated temps. where the relative humidity may be reduced. We report here approaches to the development of high-temperature membranes for proton exchange membrane fuel cells; composite perfluorinated sulfonic acid membranes were prepared to improve water retention, and nonaq. proton conducting membranes were prepared to circumvent the loss of water. Exptl. results of composite membranes of Nafion and zirconium phosphate show improved operation at elevated temps. Imidazole impregnated membranes poisoned the electrocatalysts. Cesium hydrogen sulfate membranes were not able to produce appreciable current. A brief anal. of temperature requirements for CO tolerance and a framework for understanding water loss from fuel cell membranes are presented.

IT 7789-16-4, Cesium hydrogen sulfate
 RL: DEV (Device component use); USES (Uses)
 (composite membrane containing; approaches and tech. challenges to high-temperature operation of proton exchange membrane fuel cells with)

RN 7789-16-4 HCAPLUS
 CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST proton exchange membrane fuel cell operation
 IT Fuel cells
 (approaches and tech. challenges to high-temperature
 operation of proton exchange membrane fuel
 cells)
 IT Polyoxyalkylenes, uses
 RL: DEV (Device component use); USES (Uses)
 (fluorine- and sulfo-containing, ionomers; approaches and
 tech. challenges to high-temperature operation of proton
 exchange membrane fuel cells with)
 IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses)
 (polyoxyalkylene-, sulfo-containing, ionomers; approaches
 and tech. challenges to high-temperature operation of proton
 exchange membrane fuel cells with)
 IT Ionomers
 RL: DEV (Device component use); USES (Uses)
 (polyoxyalkylenes, fluorine- and sulfo-containing; approaches and
 tech. challenges to high-temperature operation of proton
 exchange membrane fuel cells with)
 IT 288-32-4, Imidazole, uses 7789-16-4, Cesium hydrogen
 sulfate 13772-29-7, Zirconium hydrogen phosphate
 [Zr(HPO₄)₂] 77950-55-1, Nafion 115
 RL: DEV (Device component use); USES (Uses)
 (composite membrane containing; approaches and tech. challenges to
 high-temperature operation of proton exchange membrane
 fuel cells with)

L379 ANSWER 70 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2001:638121 Porous oxide electrolyte membranes for
 fuel cells. Tejedor-Tejedor, M. Isabel; Anderson,
 Marc A. (Environmental Chemistry and Technology Program, University
 of Wisconsin, Madison, WI, 53706, USA). Abstracts of Papers, 222nd
 ACS National Meeting, Chicago, IL, United States, August 26-30,
 2001, COLL-085. American Chemical Society: Washington, D. C.
 (English) 2001. CODEN: 69BUZP.

AB Background: We fabricate microporous oxide membranes as alternatives to organic polymeric electrolytes in PEM fuel cells. These materials should operate at much higher temps. (>150 °C) than organic polymers while still retaining water, which helps resolve problems with water management and carbon monoxide poisoning. These membranes are cast as thin films directly on and then fired to the cathode and anode. This intimate contact may alleviate charge transfer limitations at the electrode/membrane interface. For future scale-up, membrane electrode assemblies that incorporate microporous inorg. membranes should be easily fabricated using tape or gel-casting techniques, making this process com. viable. Our previous research has shown that crack-free inorg. membranes can be deposited on porous nickel supports. Proton conductivities of these materials as measured across a micro-porous monolith can reach 5x10⁻² S/cm at 25 °C and 81% relative humidity, corresponding to a specific resistivity of 2x10⁻³ Ω·cm². Currently, these membranes are being incorporated in test cells for further evaluation at Los Alamos. To date, we have measured proton conductivities of TiO₂ materials at temps. to 15-40 °C and humidities from 33-90%. Gas permeabilities of TiO₂ membranes on supports have also been measured. Preliminary conductivity data on SiO₂ and Al₂O₃ are favorable, but we have yet to test mixed oxides. Energies of activation for conducting protons through TiO₂ depend on the number of water mols./nm². Two operating regimes and mechanisms are apparent: 1.) Ea decreases with increasing water content and 2.) Ea increases with increasing water coverage. The abrupt change in

mechanism at the min. occurs when the pores fill with water. Ea also depends on the surface chemical of the pore wall (i.e., degree of protonation and type of surface bound species). Therefore, surface chemical and pore morphol. (size and shape) should greatly affect proton conductivity in TiO₂ membranes.

L379 ANSWER 71 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:339933 Document No. 135:112221 Atomistic diffusion mechanism in high temperature proton conductors.

Hempelmann, R.; Gross, B. (Physikalische Chemie, Universitat des Saarlandes, Saarbrucken, D-66123, Germany). Schriften des Forschungszentrums Juelich, Reihe Energietechnik/Energy Technology, 15 (Pt. 2, High Temperature Materials Chemistry, Part 2), 597-600 (English) 2000. CODEN: SFJTF2. ISSN: 1433-5522. Publisher: Forschungszentrum Juelich GmbH.

AB From the point of view of applied research these materials have attracted attention because of applications as hydrogen sensors and possible applications as proton conducting electrolytes in solid oxide fuel cells (SOFC). From the point of view of fundamental research these materials exhibit complex proton transport properties and thus represent a challenge both for experimentalists and theoreticians. In the present contribution we will briefly summarize our scientific contributions to the elucidation of the proton diffusion mechanism. We have applied quasielastic neutron scattering and - with the pos. muon as radioactive tracer for the proton - muon spin relaxation. Both these powerful microscopic (atomistic) techniques have not been used before in connection with proton conducting oxides. To support the novel results obtained in these ways we have performed impedance spectroscopy to measure the proton conductivity and ¹⁵N nuclear resonance reaction analyses to investigate the thermodn. of water vapor absorption.

IT 158634-63-0D, Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O₉), oxygen deficient

RL: PRP (Properties)
(water vapor pressure/composition isotherms)

RN 158634-63-0 HCAPLUS

CN Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O₉) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	9	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

CC 65-4 (General Physical Chemistry)

Section cross-reference(s): 76

ST diffusion mechanism high temp proton conductor

IT Diffusion

Ionic conductors

Muon spin rotation

Neutron scattering

Perovskite-type crystals

(QENS and μ SR studies of diffusion mechanism in high temperature proton conductors)

IT Ionic conductivity

(proton; QENS and μ SR studies of diffusion mechanism in high temperature proton conductors)

IT 12408-02-5, Hydrogen ion, properties

RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)

- (QENS and μ SR studies of diffusion mechanism in high temperature proton conductors)
- IT 123082-62-2D, Cerium strontium ytterbium oxide ((Ce,Yb)SrO₃), oxygen deficient 349654-60-0D, Barium ytterbium zirconium oxide (Ba(Yb,Zr)O₃), oxygen deficient 349654-61-1D, Scandium strontium zirconium oxide ((Sc,Zr)SrO₃), oxygen deficient
RL: PRP (Properties)
(QENS and μ SR studies of diffusion mechanism in high temperature proton conductors)
- IT 158634-63-0D, Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O₉), oxygen deficient
RL: PRP (Properties)
(water vapor pressure/composition isotherms)

L379 ANSWER 72 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:299258 Document No. 134:313632 Fuel cell electrodes made of polymer electrolyte-catalyst composites, and their manufacture. Hitomi, Shuji (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001118582 A2 20010427, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-297302 19991019.

AB The electrodes contain cation exchange resins, C particles, and catalyst metals having cores and outer layers. The cores comprise 1-4 metals selected from Pt, Ru, Rh, Pd, and Ir. The outer layers contain Pt, Ru, Rh, Pd, and/or Ir but use the metals different from the cores. The amount of catalyst metals supported on the C particles in contact with H⁺-conducting passages in the resins is >50% of total catalyst metals supported. The electrode manufacturing processes including 2-stage adsorption and reduction of cations, are also described. The electrodes have high resistance to CO catalyst poisoning, activity to oxidation of MeOH, and utilization and alloying ratio of the catalyst metals.

IT 7440-05-3, Palladium, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

- IC ICM H01M004-90
ICS H01M004-88; H01M004-92; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST fuel cell electrode polymer electrolyte
catalyst composite; cation exchange resin fuel
cell electrode; carbon particle fuel cell
electrode; metal catalyst fuel cell
electrode
- IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst support, Vulcan XC 72; fuel
cell electrodes containing cation exchange resins,
C particles, and core-shell catalyst metals, and their
manufacture for high catalyst activity)
- IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, ionomers, Nafion;
fuel cell electrodes containing cation

exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)

IT Cation exchangers
 Fuel cell electrodes
 (fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)

IT Fluoropolymers, uses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (polyoxyalkylene-, sulfo-containing, ionomers, Nafion; fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)

IT Ionomers
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (polyoxyalkylenes, fluorine- and sulfo-containing, Nafion; fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)

IT 7439-88-5, Iridium, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)

L379 ANSWER 73 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2001:296206 Document No. 135:79358 Non-stoichiometry, grain boundary transport and chemical stability of proton conducting perovskites. Haile, S. M.; Staneff, G.; Ryu, K. H. (Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Journal of Materials Science, 36(5), 1149-1160 (English) 2001. CODEN: JMTSAS. ISSN: 0022-2461. Publisher: Kluwer Academic Publishers.

AB The interrelationship between defect chemical, non-stoichiometry, grain boundary transport and chemical stability of proton conducting perovskites (doped alkaline earth cerates and zirconates) has been investigated. Non-stoichiometry, defined as the deviation of the A:M molar ratio in AMO₃ from 1:1, dramatically impacts conductivity, sinterability and chemical stability with respect to reaction with CO₂. In particular, alkaline earth deficiency encourages dopant incorporation onto the A-atom site, rather than the intended M-atom site, reducing the concentration of oxygen vacancies. Transport along grain boundaries is, in general, less favorable than transport through the bulk, and thus only in fine-grained materials does microstructure impact the overall elec. properties. The chemical stability of high conductivity cerates is enhanced by the introduction of Zr. The conductivity of BaCe_{0.9-x}ZrxM_{0.103} perovskites monotonically decreases with increasing x (increasing Zr content), with the impact of Zr substitution increasing in the order M = Yb → Gd → Nd. Furthermore, the magnitude of the conductivity follows the same sequence for a given zirconium content. This result is interpreted in terms of dopant ion incorporation onto the divalent ion site.

IT 123998-55-0, Barium cerium neodymium zirconium oxide BaCe_{0.8}Nd_{0.1}Zr_{0.103} 235098-96-1, Barium cerium neodymium zirconium oxide BaCe_{0.7}Nd_{0.1}Zr_{0.203} 235098-98-3, Barium cerium gadolinium zirconium oxide BaCe_{0.8}Gd_{0.1}Zr_{0.103} 235099-00-0, Barium cerium gadolinium zirconium oxide BaCe_{0.7}Gd_{0.1}Zr_{0.203}
 RL: PRP (Properties)
 (nonstoichiometry, grain boundary transport and chemical stability

of proton conducting perovskites)

RN 123998-55-0 HCPLUS
 CN Barium cerium neodymium zirconium oxide ($BaCe0.8Nd0.1Zr0.1O_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCPLUS
 CN Barium cerium neodymium zirconium oxide ($BaCe0.7Nd0.1Zr0.2O_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCPLUS
 CN Barium cerium gadolinium zirconium oxide ($BaCe0.8Gd0.1Zr0.1O_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCPLUS
 CN Barium cerium gadolinium zirconium oxide ($BaCe0.7Gd0.1Zr0.2O_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72, 76

ST fuel cell electrolyte proton
 conducting perovskite; grain boundary transport
 proton conducting perovskite
 IT Electric conductivity
 Electrolytes
 Fuel cell electrolytes
 Grain boundaries
 Nonstoichiometry
 Perovskite-type crystals
 (nonstoichiometry, grain boundary transport and chemical stability
 of proton conducting perovskites)

IT 12009-21-1, barium zirconium oxide bazro₃ 12036-39-4, strontium zirconium oxide srzro₃ 12267-77-5, barium cerium oxide baceo₃ 12267-97-9, cerium strontium oxide cesro₃ 112235-03-7, Barium cerium neodymium oxide BaCe0.9Nd0.1O₃ 123998-55-0, Barium cerium neodymium zirconium oxide BaCe0.8Nd0.1Zr0.1O₃ 136575-37-6, Barium cerium ytterbium oxide BaCe0.9Yb0.1O₃ 136575-38-7, Barium cerium gadolinium oxide BaCe0.9Gd0.1O₃ 235098-96-1, Barium cerium neodymium zirconium oxide BaCe0.7Nd0.1Zr0.2O₃ 235098-98-3, Barium cerium gadolinium zirconium oxide BaCe0.8Gd0.1Zr0.1O₃ 235099-00-0, Barium cerium gadolinium zirconium oxide BaCe0.7Gd0.1Zr0.2O₃ 347886-57-1, Barium cerium ytterbium zirconium oxide (BaCe0.8Yb0.1Zr0.1O₃) 347886-58-2, Barium cerium ytterbium zirconium oxide (BaCe0.7Yb0.1Zr0.2O₃) RL: PRP (Properties)
(nonstoichiometry, grain boundary transport and chemical stability of proton conducting perovskites)

L379 ANSWER 74 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:200192 Microporous oxides as **electrolytes** in proton exchange membrane fuel cells. Anderson, Marc A.; Tejedor, M. Isabel (Water Chemistry Program, University of Wisconsin, Madison, WI, 53706, USA). Abstracts of Papers, 221st ACS National Meeting, San Diego, CA, United States, April 1-5, 2001 ENVR-137 (English) 2001. CODEN: 69FZD4. Publisher: American Chemical Society.

AB We have been investigating the phys. and electrochem. characteristics of inorg. membrane materials composed of microporous SiO₂, TiO₂ and Al₂O₃. All of these materials have high surface areas and high porosity. The Al₂O₃ membranes materials can be described as having slit-like pores of width less than 20 angstroms. SiO₂ and TiO₂ membrane materials contain randomly packed spherical nanoparticles and pore size in the mesoporous region. Our calcns. indicate that for our oxide samples equilibrated under conditons of 81% relative humidity and, at 25°C the number of water mols. contained as expressed in mmols/cm³ are 20, 26 and 25 for SiO₂, TiO₂ and Al₂O₃ resp. Measured proton conductivities of all three oxides increase with increasing relative humidity, SiO₂ and TiO₂ increasing over 3 orders of magnitude between RH values of 33% and 97%. We also find that, at 81% RH, conductivities generally increase with increasing temperature with SiO₂ increasing lineraly but TiO₂ and Al₂O₃ exponentially. Activation energies for our materials are 15.8, 17.0 and 17.1 kJ.Mol⁻¹ for SiO₂, TiO₂, and Al₂O₃ resp. While our best values for the conductivities of our inorg. electrolytes are still about a factor of two less than an organic polymer membrane such as Nafion (5 x10⁻³ cm⁻¹ vs at 80°C vs. 1.3 x 10⁻² cm⁻¹ at 79°C), it should be noted that we are comparing absolute values for the conductivity. In practice, these ceramic membranes would be cast unto porous conducting supports with thicknesses less than 0.5 μ. Nafion membranes are typically around 200mm thick. This means that we should be capable of greatly reducing the actual resistance of these membrane electrolytes, and this, along with higher possible operating temps. should prove to make these systems com. competitive.

L379 ANSWER 75 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2001:20006 Document No. 134:165585 Complex impedance studies of proton-conducting membranes. Edmondson, C. A.; Stallworth, P. E.; Chapman, M. E.; Fontanella, J. J.; Wintersgill, M. C.; Chung, S. H.; Greenbaum, S. G. (Physics Department, U.S. Naval Academy, Annapolis, MD, 21402-5026, USA). Solid State Ionics, 135(1-4), 419-423 (English) 2000. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Complex impedance studies have been carried out on Dow 800, Dow 1000 and Nafion 117 membranes at various water contents and a variety of temps. and hydrostatic pressures. At room temperature

and pressure the usual gradual decrease in elec. conductivity with decreasing water content is observed. For very low water content materials the variation of the conductivity with pressure from 0 to 0.2 GPa (2 kbar) is large and gives rise to apparent activation vols., ΔV , as large as 54 cm³/mol. In addition, for low water content materials, there is a tendency for smaller equivalent wts. (same side chains) or larger side chains to have larger activation vols. At high water content, ΔV is relatively independent of the host polymer and neg. values are observed at the highest water contents. These results provide support for the model where proton transport in high water content sulfonated fluorocarbons is similar to that for liquid water. All results are explained qual. via free volume Ambient-pressure, variable-temperature 2HT1 and linewidth measurements imply a heterogeneous environment of the water mols. Proton pulsed field gradient NMR studies in saturated Dow membranes verify the expectation that ionic conductivity is determined primarily by diffusion of water mols.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST Section cross-reference(s): 36
 IT fuel cell proton conducting membrane impedance
 Electric conductivity
 Fuel cell electrolytes
 Fuel cells
 Membranes, nonbiological
 (complex impedance studies of proton-conducting membranes)
 IT Polyoxyalkylenes, properties
 RL: PRP (Properties)
 (fluorine- and sulfo-containing, ionomers; complex impedance studies of proton-conducting membranes)
 IT Fluoropolymers, properties
 RL: PRP (Properties)
 (polyoxyalkylene-, sulfo-containing, ionomers; complex impedance studies of proton-conducting membranes)
 IT Ionomers
 RL: PRP (Properties)
 (polyoxyalkylenes, fluorine- and sulfo-containing; complex impedance studies of proton-conducting membranes)
 IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses)
 (sulfonated; complex impedance studies of proton-conducting membranes)
 IT 66796-30-3, Nafion 117 163515-65-9, Dow 800 324749-88-4, Dow 1000
 RL: PRP (Properties)
 (complex impedance studies of proton-conducting membranes)

L379 ANSWER 76 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2000:773924 Document No. 133:337259 Two-phase perovskite ionic and electric conductors as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing.
 Wachsman, Eric D.; Jiang, Naixiong (Her Majesty In Right of Canada as Represented by the Minister of Natural Resources, Can.). Eur. Pat. Appl. EP 1048614 A1 20001102, 11 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2000-303635 20000428. PRIORITY: US 1999-302786 19990430.

AB A two-phase ionic conductor which exhibits both hydrogen ion conductivity and elec. conductivity consists of (1) a perovskite-type oxide of general formula ABO_3 , in which A is an element selected from Ba, Ca, Mg, and Sr, B is $Ce_{1-x}M_x$ or $Zr_{1-x}M_x$ (M is a selected from Y, Yb, In, Gd, Nd, Eu, Sm, and Tb), and $x = 0-1$; and (2) an elec. conductor comprising palladium. The palladium may be coated on particles of the oxide in the form of an oxide powder. These ionic conductors can act as ionic membranes for H₂ sepns.

in reforming of light hydrocarbons to synthesis gas and for H₂ manufacture from natural gas or C>1-hydrocarbons.

IT 7440-05-3, Palladium, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (perovskite membranes containing; two-phase perovskite ionic and elec. conductors as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)

RN 7440-05-3 HCPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IT 131960-38-8P, Strontium yttrium zirconium oxide (SrY0.05Zr0.95O₃) 304016-28-2P, Strontium yttrium zirconium oxide (SrY0.04Zr0.96O₃)
 RL: NUU (Other use, unclassified); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 (perovskite, membranes containing; two-phase perovskite ionic and elec. conductors as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)

RN 131960-38-8 HCPLUS

CN Strontium yttrium zirconium oxide (SrY0.05Zr0.95O₃) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

RN 304016-28-2 HCPLUS
 CN Strontium yttrium zirconium oxide (SrY0.04Zr0.96O₃) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.96	7440-67-7
Y	0.04	7440-65-5
Sr	1	7440-24-6

IC ICM C01B003-50
 ICS B01D053-22; B01D071-02; C01G025-00; C01F017-00; H01M008-06
 CC 49-1 (Industrial Inorganic Chemicals)
 Section cross-reference(s): 51, 52, 57
 ST perovskite ionic elec cond membrane; hydrogen permeation
 perovskite membrane; palladium perovskite hydrogen sepn membrane;
 natural gas hydrogen sepn membrane; synthesis gas hydrogen sepn
 membrane; fuel cell hydrogen sepn membrane
 IT Perovskite-type crystals
 (membranes containing; two-phase perovskite ionic and elec.
 conductors as hydrogen separation membranes in hydrogen
 recovery from synthesis gas and hydrocarbon processing)
 IT Fuel cells
 (membranes, hydrogen manufacture with; two-phase perovskite
 ionic and elec. conductors as hydrogen separation
 membranes in hydrogen recovery from synthesis gas and hydrocarbon
 processing)
 IT Electric conductors
 (perovskite membranes; two-phase perovskite ionic and elec.
 conductors as hydrogen separation membranes in hydrogen

- recovery from synthesis gas and hydrocarbon processing)
- IT Natural gas, reactions
 RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
 PROC (Process); RACT (Reactant or reagent)
 (processing, hydrogen manufacture from; two-phase perovskite ionic and
 elec. conductors as hydrogen separation membranes in
 hydrogen recovery from synthesis gas and hydrocarbon processing)
- IT Ionic conductors
 (proton, perovskite membranes; two-phase perovskite
 ionic and elec. conductors as hydrogen separation membranes
 in hydrogen recovery from synthesis gas and hydrocarbon
 processing)
- IT Synthesis gas manufacturing
 (reforming synthesis gas manufacturing, hydrogen manufacture by; two-phase
 perovskite ionic and elec. conductors as hydrogen separation
 membranes in hydrogen recovery from synthesis gas and hydrocarbon
 processing)
- IT 7440-05-3, Palladium, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (perovskite membranes containing; two-phase perovskite ionic and
 elec. conductors as hydrogen separation membranes in
 hydrogen recovery from synthesis gas and hydrocarbon processing)
- IT 110687-91-7P, Cerium strontium ytterbium oxide (Ce0.95SrYb0.05O3)
 112235-02-6P, Barium cerium neodymium oxide (BaCe0.95Nd0.05O3)
 112235-03-7P, Barium cerium neodymium oxide (BaCe0.9Nd0.1O3)
 113876-58-7P, Barium cerium yttrium oxide (BaCe0.90Y0.1O3)
 131960-38-8P, Strontium yttrium zirconium oxide
 (SrY0.05Zr0.95O3) 136575-37-6P, Barium cerium ytterbium oxide
 (BaCe0.9Yb0.1O3) 136575-39-8P, Barium cerium yttrium oxide
 (BaCe0.95Y0.05O3) 137806-35-0P, Calcium indium zirconium oxide
 (CaIn0.04Zr0.96O3) 140883-59-6P, Strontium ytterbium zirconium
 oxide (SrYb0.05Zr0.95O3) 142107-79-7P, Calcium indium zirconium
 oxide (CaIn0.1Zr0.9O3) 143312-53-2P, Barium cerium yttrium oxide
 (BaCe0.8Y0.2O3) 144049-10-5P, Barium cerium gadolinium oxide
 (BaCe0.85Gd0.15O3) 144378-46-1P, Barium cerium gadolinium oxide
 (BaCe0.8Gd0.2O3) 148972-97-8P, Barium cerium samarium oxide
 (BaCe0.8Sm0.2O3) 150232-28-3P, Barium yttrium zirconium oxide
 (BaY0.05Zr0.95O3) 150232-31-8P, Calcium indium zirconium oxide
 (CaIn0.05Zr0.95O3) 184022-90-0P, Barium cerium europium oxide
 (BaCe0.85Eu0.15O3) 304016-22-6P, Barium cerium terbium oxide
 (BaCe0.85Tb0.15O3) 304016-28-2P, Strontium yttrium
 zirconium oxide (SrY0.04Zr0.96O3)
 RL: NUU (Other use, unclassified); PRP (Properties); SPN (Synthetic
 preparation); PREP (Preparation); USES (Uses)
 (perovskite, membranes containing; two-phase perovskite ionic and
 elec. conductors as hydrogen separation membranes in
 hydrogen recovery from synthesis gas and hydrocarbon processing)
- IT 1333-74-0P, Hydrogen, preparation
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (recovery of; two-phase perovskite ionic and elec.
 conductors as hydrogen separation membranes in hydrogen
 recovery from synthesis gas and hydrocarbon processing)
- IT 74-82-8, Methane, reactions
 RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
 PROC (Process); RACT (Reactant or reagent)
 (reforming of; two-phase perovskite ionic and elec.
 conductors as hydrogen separation membranes in hydrogen
 recovery from synthesis gas and hydrocarbon processing)

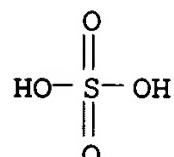
L379 ANSWER 77 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2000:721148 Document No. 133:364386 Polymer solid acid composite
 membranes for fuel-cell applications. Boysen,
 Dane A.; Chisholm, Calum R. I.; Haile, Sossina M.; Narayanan,
 Sekharipuram R. (Department of Materials Science, California
 Institute of Technology, Pasadena, CA, 91125, USA). Journal of the
 Electrochemical Society, 147(10), 3610-3613 (English) 2000. CODEN:

AB JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.
 A systematic study of the conductivity of polyvinylidene fluoride (PVDF) and CsHSO₄ composites, containing 0 to 100% CsHSO₄, has been carried out. The polymer, with its good mech. properties, served as a supporting matrix for the high proton cond inorg. phase. The conductivity of composites exhibited a sharp increase with temperature at 142°C, characteristic of the superprotic phase transition of CsHSO₄. At high temperature (160°C), the dependence of conductivity on vol % CsHSO₄ was monotonic and revealed a percolation threshold of .apprx.10 volume%. At low temperature (100°C), a maximum in the conductivity at .apprx.80 vol % CsHSO₄ was observed. Results of preliminary fuel cell measurements are presented.

IT 7789-16-4, Cesium hydrogen sulfate
 RL: DEV (Device component use); USES (Uses)
 (polymer solid acid composite membranes for fuel-cell applications)

RN 7789-16-4 HCPLUS

CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 72, 76

ST polyvinylidene fluoride cesium hydrogen sulfate electrolyte
 ; fuel cell solid electrolyte

IT Fuel cell electrolytes
 Ionic conductivity
 Structural phase transition
 (polymer solid acid composite membranes for fuel-cell applications)

IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses)
 (polymer solid acid composite membranes for fuel-cell applications)

IT 7789-16-4, Cesium hydrogen sulfate 24937-79-9,
 Polyvinylidene fluoride
 RL: DEV (Device component use); USES (Uses)
 (polymer solid acid composite membranes for fuel-cell applications)

L379 ANSWER 78 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2000:535394 Document No. 133:137861 Proton
 conducting membrane using a solid acid for fuel cells. Haile, Sossina M.; Boysen, Dane; Narayanan, Sekharipuram R.; Chisholm, Calum (California Institute of Technology, USA). PCT Int. Appl. WO 2000045447 A2 20000803, 61 pp.
 DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2.
 APPLICATION: WO 2000-US1783 20000121. PRIORITY: US 1999-PV116741

19990122; US 1999-PV146946 19990802; US 1999-PV146943 19990802; US 1999-PV151811 19990830; US 1999-439377 19991115.

AB A solid acid material is used as a **proton conducting** membrane in an electrochem. device. The solid acid material can be one of a plurality of different kinds of materials. A binder can be added, and that binder can be either a nonconducting or a conducting binder. Nonconducting binders can be, for example, a polymer or a glass. A conducting binder enables the device to be both **proton conducting** and electron conducting.

IT 7789-16-4, Cesium hydrogen sulfate cshso₄ 10294-60-7
, Ammonium hydrogen selenate 18649-05-3, Cesium dihydrogen phosphate 63317-98-6 89190-25-0

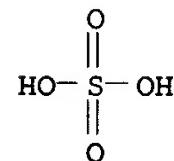
161882-09-3 286382-81-8

RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(proton conducting membrane using solid acid for fuel cells)

RN 7789-16-4 HCPLUS

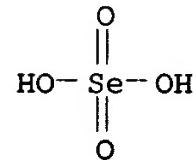
CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 10294-60-7 HCPLUS

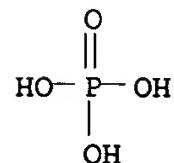
CN Selenic acid, monoammonium salt (9CI) (CA INDEX NAME)



● NH₃

RN 18649-05-3 HCPLUS

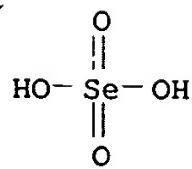
CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



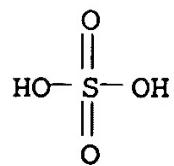
● Cs

RN 63317-98-6 HCPLUS

CN Selenic acid, ammonium salt (2:3) (9CI) (CA INDEX NAME)

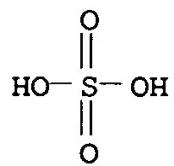
● 3/2 NH₃

RN 89190-25-0 HCPLUS
 CN Sulfuric acid, cesium salt (2:3) (9CI) (CA INDEX NAME)



● 3/2 Cs

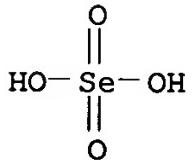
RN 161882-09-3 HCPLUS
 CN Sulfuric acid, cesium salt (4:5), hydrate (9CI) (CA INDEX NAME)



● 5/4 Cs

● x H₂O

RN 286382-81-8 HCPLUS
 CN Selenic acid, ammonium salt (4:5), hydrate (9CI) (CA INDEX NAME)

● 5/4 NH₃● x H₂O

ICI H01
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72, 76
ST fuel cell proton conducting
membrane solid acid
IT Conducting polymers
Electric conductors
Electric insulators
Semiconductor materials
(binder; proton conducting membrane using
solid acid for fuel cells)
IT Fluoropolymers, uses
Glass, uses
Metals, uses
Polyesters, uses
Polymers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(binder; proton conducting membrane using
solid acid for fuel cells)
IT Sintering
(hot pressing; proton conducting membrane
using solid acid for fuel cells)
IT Polyketones
Polyketones
RL: TEM (Technical or engineered material use); USES (Uses)
(polyether-; proton conducting membrane using
solid acid for fuel cells)
IT Polyethers, uses
Polyethers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(polyketone-; proton conducting membrane
using solid acid for fuel cells)
IT Battery electrolytes
Ceramics
Electrolytic cells
Fuel cell electrolytes
Fuel cells
(proton conducting membrane using solid acid
for fuel cells)
IT Fluoropolymers, uses
Phosphates, uses
Polyanilines
Polysiloxanes, uses
Selenates
Silicates, uses
Sulfates, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(proton conducting membrane using solid acid
for fuel cells)
IT Capacitors
(supercapacitor; proton conducting membrane
using solid acid for fuel cells)
IT 7440-21-3, Silicon, uses 24937-79-9, Pvdf
RL: TEM (Technical or engineered material use); USES (Uses)
(binder; proton conducting membrane using
solid acid for fuel cells)
IT 7782-42-5, Graphite, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(paper; proton conducting membrane using
solid acid for fuel cells)
IT 7722-76-1, Ammonium dihydrogen phosphate 7789-16-4, Cesium
hydrogen sulfate cshso₄ 7803-63-6, Ammonium hydrogen sulfate
10294-60-7, Ammonium hydrogen selenate 12593-60-1,
Ammonium phosphate sulfate ((NH₄)₂(H₂PO₄)(HSO₄)) 13453-45-7,
Thallium hydrogen sulfate tlhsso₄ 13774-16-8, Rubidium dihydrogen

phosphate 13775-30-9 13778-50-2, Sodium silicate Na₃HSiO₄
 13780-02-4 15457-97-3, Sodium silicate (Na₂H₂SiO₄) 15587-72-1,
 Rubidium hydrogen sulfate 16331-85-4 18649-05-3, Cesium
 dihydrogen phosphate 20583-58-8, Sulfuric acid, rubidium
 salt (2:3) 22112-04-5 39473-99-9, Rubidium phosphate
 selenate (Rb₂(H₂PO₄)(HSeO₄)) 41469-37-8, Sodium silicate NaH₃SiO₄
 63317-98-6 63737-07-5, Cesium hydrogen selenate cshseo₄
 68875-27-4, Rubidium hydrogen selenate 71555-62-9 88937-51-3
 89190-25-0 99489-71-1, Ammonium arsenate sulfate
 ((NH₄)₂(H₂AsO₄)(HSO₄)) 99543-07-4, Selenic acid, cesium
 salt (2:3) 101811-97-6, Potassium silicate KH₃SiO₄
 135498-03-2 135710-63-3 157612-88-9 161430-99-5, Tellurium
 oxide teo₄ 161882-09-3 165901-90-6, Cesium phosphate
 sulfate (Cs₃(H₂PO₄)(HSO₄)₂) 183953-14-2, Silicic acid (H₄SiO₄),
 tripotassium salt 183953-17-5, Silicic acid (H₄SiO₄),
 dipotassium salt 213411-40-6, Cesium phosphate sulfate
 (Cs₃(H₂PO₄)_{0.5}(HSO₄)_{2.5}) 218931-29-4, Cesium phosphate sulfate
 (Cs₅(H₂PO₄)₂(HSO₄)₃) 220078-67-1, Cesium phosphate selenate
 (Cs₃(H₂PO₄)(HSeO₄)₂) 220078-71-7, Cesium phosphate selenate
 (Cs₅(H₂PO₄)₂(HSeO₄)₃) 231277-45-5, Cesium phosphate sulfate
 (Cs₂(H₂PO₄)(HSO₄)) 233277-01-5, Ammonium phosphate selenate
 ((NH₄)₂(H₂PO₄)(HSeO₄)) 260429-55-8, Rubidium phosphate sulfate
 (Rb₂(H₂PO₄)(HSO₄)) 286382-74-9, Cesium phosphate selenate
 (Cs₂(H₂PO₄)(HSeO₄)) 286382-75-0 286382-77-2 286382-78-3
 286382-79-4, Cesium phosphate selenate (Cs₃(H₂PO₄)_{0.5}(HSeO₄)_{2.5})
 286382-81-8 286382-82-9 286382-83-0 286382-84-1
 286382-85-2 286382-86-3 286382-87-4 286382-88-5 286382-89-6
 286382-90-9

RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(proton conducting membrane using solid acid for fuel cells)

IT 1302-88-1, Cordierite 1309-48-4, Magnesia, uses 1344-28-1,
 Alumina, uses 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses
 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-50-8,
 Copper, uses 7440-57-5, Gold, uses 7440-66-6, Zinc, uses
 7631-86-9, Silica, uses 9002-84-0, Ptfe 25038-78-2,
 Poly(dicyclopentadiene) 25233-30-1, Polyaniline 25667-42-9
 30604-81-0, Polypyrrole 31900-57-9, Polydimethyl siloxane
 RL: TEM (Technical or engineered material use); USES (Uses)

(proton conducting membrane using solid acid for fuel cells)

IT 1333-74-0P, Hydrogen, preparation
 RL: PUR (Purification or recovery); PREP (Preparation)
 (separator; proton conducting membrane using solid acid for fuel cells)

L379 ANSWER 79 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 2000:143468 Document No. 132:168778 Substrate supported
 catalyst layers for polymer electrolyte fuel
 cell electrodes, inks and method for manufacture the
 catalyst layer, gas diffusion electrodes, catalyst membrane
 assembly, and electrode membrane assembly. Zuber, Ralf; Kalhi,
 Ralf; Knut, Fehl; Starz, Karl-Anton (Degussa-Huls A.-G., Germany).
 Jpn. Kokai Tokkyo Koho JP 2000067873 A2 20000303, 9 pp. (Japanese).
 CODEN: JKXXAF. APPLICATION: JP 1999-232591 19990819. PRIORITY: DE
 1998-19837669 19980820.

AB The catalyst layers contain a H⁺ conductive
 ionomer and noble metal laded conductive carbonaceous
 particles, and are prepared from an ink containing the ionomer, the
 carbonaceous particles, and a 0 valence noble metal
 complex by applying the ink on a substrate and decomposing the complex
 at a temperature that does cause damage to the substrate. The
 gas diffusion electrodes have the catalyst layer on a gas diffusing
 substrate, the catalyst membrane assembly has the catalyst layer on
 both side of a polymer electrolyte membrane, and the

electrode membrane assembly has gas diffusion structures on both sides of the catalyst membrane assembly.

IC ICM H01M004-86
ICS H01M004-88; H01M004-90; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST polymer electrolyte fuel cell
electrode catalyst
IT Carbon black, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, ionomers; electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine-containing, sulfo-containing, ionomers; electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Fuel cell electrodes
(in manufacture of electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Fluoropolymers, uses
Fluoropolymers, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers; electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Ionomers
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing; electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT 7440-06-4, Platinum, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT 2627-95-4DP, 1,3-Divinyl-1,1,3,3-tetramethyldisiloxane, reaction products with platinum 48018-87-7DP, reaction products with 1,3-divinyl-1,1,3,3-tetramethyl disiloxane
RL: IMF (Industrial manufacture); NUU (Other use, unclassified); PREP (Preparation); USES (Uses)
(in manufacture of electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

L379 ANSWER 80 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
2000:116981 Document No. 132:174949 Inorganic hydrogen and hydrogen polymer compounds and applications thereof. Mills, Randell L.
(USA). PCT Int. Appl. WO 2000007931 A2 20000217, 385 pp.
DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY,

CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1999-US17129 19990729. PRIORITY: US 1998-95149 19980803; US 1998-101651 19980924; US 1998-105752 19981026; US 1998-113713 19981224; US 1999-123835 19990311; US 1999-130491 19990422; US 1999-141036 19990629.

AB Compds. are provided comprising at least one neutral, pos., or neg. hydrogen species having a binding energy greater than its corresponding ordinary hydrogen species, or greater than any hydrogen species for which the corresponding ordinary hydrogen species is unstable or is not observed. Compds. comprise at least one increased binding energy hydrogen species and at least one other atom, mol., or ion other than an increased binding energy hydrogen species. One group of such compds. contains one or more increased binding energy hydrogen species selected from the group consisting of H_n , H_{n-} , and H_{n+} , where n is a pos. integer, with the proviso that $n > 1$ when H has a pos. charge. Another group of such compds. may have the formula $[MH_mM'X]_n$ wherein m and n are each an integer, M and M' are each an alkali or alkaline earth cation, X is a singly or doubly neg. charged anion, and the hydrogen content H_m of the compound comprises at least one increased binding energy hydrogen species. Methods of forming the compds. and numerous applications are disclosed. A method for forming the compds. comprises reacting gaseous hydrogen atoms with a gaseous metal catalyst (list of metals provided) and reaction of the formed hydrino atoms with at least one selected from the group of a source of electrons (H^+ , increased binding energy hydrogen species, other element). A method for extracting energy from H atoms further comprises the step of applying an adjustable elec. or magnetic field to control the rate of energy release. Thus, potassium iodo hydride (KHI) comprising high binding energy hydride ions (hydrino hydrides) are prepared by reaction of atomic hydrogen with potassium iodide in the presence of potassium metal catalyst in a stainless steel gas cell (apparatus diagrams provided). The blue crystals were characterized by a number of methods (ToF-SIMS, XPS, ^{1}H and ^{39}K MAS NMR, FTIR, Electrospray-Ionization-Time-of-Flight Mass Spectroscopy, LC/MS, elemental anal., thermal decomposition). The compound contains two forms of hydride ion; thermal decomposition with mass spectral anal. indicates at least $H-(1/2)$ is present in KHI which may be responsible for the blue color. The objective of the invention is to provide compds. that can be used in a wide variety of applications, e.g., batteries, fuel cells, cutting materials, light-weight high-strength materials and synthetic fibers, corrosion or heat-resistant coatings, xerog. compds., proton source, photoluminescent compds., phosphors for lighting, UV and visible light source, photoconductors, photovoltaics, chemiluminescent or fluorescent compds., optical coatings or filters, extreme UV laser media, fiber optic cables, magnets and magnetic computer storage media, superconductors, etching agents, masking agents, agents to purify silicon, dopants in semiconductor fabrication, cathodes for thermoionic generators, fuels, explosives, and propellants. Claimed uses of the present invention include separation of isotopes, a proton source, xerog. toner, use in a magnet or magnetic computer memory storage material, or as an etching agent. Time-of-flight secondary ion mass spectral data (ToF-SIMS) are listed for a wide variety of hydrino hydride compds. or their fragments.

IT 7439-89-6, Iron, uses 7440-02-0,
Nickel, uses 7440-05-3, Palladium, uses
7440-32-6, Titanium, uses 7440-47-3,

Chromium, uses 7440-50-8, Copper, uses
7440-62-2, Vanadium, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst for preparation of hydrino-containing inorg. hydrogen or
hydrogen polymer compds.)
RN 7439-89-6 HCPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-32-6 HCPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM C01B006-00
CC 78-5 (Inorganic Chemicals and Reactions)
ST Section cross-reference(s): 50, 52, 67, 71, 76, 79
hydrino **hydride** inorg compd prep; hydrogen hydrino
polymer inorg compd prep; alkali **metal** hydrino
hydride prep; **metal** catalyst hydrino
hydride prep; binding energy hydrino **hydride**;
etching agent hydrino **hydride** compd; isotope sepn hydrino
hydride compd; magnet memory storage hydrino **hydride**
compd
IT Catalysts
(gaseous **metals** as catalysts in preparation of

- hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
- IT Transition metals, uses
 RL: CAT (Catalyst use); USES (Uses)
 (gaseous transition metals as catalysts for preparation of
 hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
- IT Alkaline earth compounds
 RL: ARU (Analytical role, unclassified); NUU (Other use,
 unclassified); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); ANST (Analytical study); PREP
 (Preparation); USES (Uses)
 (hydrides; preparation and uses of hydrino-containing alkaline earth
 hydrides)
- IT Alkali metal hydrides
 RL: ARU (Analytical role, unclassified); NUU (Other use,
 unclassified); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); ANST (Analytical study); PREP
 (Preparation); USES (Uses)
 (preparation and uses of hydrino-containing alkali metal
 hydrides)
- IT Hydrides
 RL: ARU (Analytical role, unclassified); NUU (Other use,
 unclassified); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); ANST (Analytical study); PREP
 (Preparation); USES (Uses)
 (preparation and uses of hydrino-containing inorg. hydrogen or hydrogen
 polymer compds.)
- IT Transition metal hydrides
 RL: ARU (Analytical role, unclassified); NUU (Other use,
 unclassified); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); ANST (Analytical study); PREP
 (Preparation); USES (Uses)
 (preparation and uses of metal hydrino-containing inorg.
 hydrogen or hydrogen polymer compds.)
- IT 7429-91-6, Dysprosium, uses 7439-89-6, Iron,
 uses 7439-90-9, Krypton, uses 7439-92-1, Lead, uses 7439-93-2,
 Lithium, uses 7439-96-5, Manganese, uses 7439-98-7, Molybdenum,
 uses 7440-02-0, Nickel, uses 7440-03-1,
 Niobium, uses 7440-05-3, Palladium, uses
 7440-06-4, Platinum, uses 7440-10-0, Praseodymium, uses
 7440-17-7, Rubidium, uses 7440-19-9, Samarium, uses 7440-24-6,
 Strontium, uses 7440-31-5, Tin, uses 7440-32-6,
 Titanium, uses 7440-38-2, Arsenic, uses 7440-41-7,
 Beryllium, uses 7440-45-1, Cerium, uses 7440-46-2, Cesium, uses
 7440-47-3, Chromium, uses 7440-48-4, Cobalt,
 uses 7440-50-8, Copper, uses 7440-54-2,
 Gadolinium, uses 7440-62-2, Vanadium, uses
 7440-66-6, Zinc, uses 7440-70-2, Calcium, uses 7782-49-2,
 Selenium, uses 13494-80-9, Tellurium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst for preparation of hydrino-containing inorg. hydrogen or
 hydrogen polymer compds.)
- IT 7440-09-7, Potassium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst for preparation of inorg. hydrides and hydrogen
 polymer compds. containing hydrino hydrides)
- IT 7681-11-0, Potassium iodide, reactions 12385-13-6, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (for preparation of inorg. hydrides and hydrogen polymer
 compds. containing hydrino hydrides)
- IT 50808-20-3DP, Silicon hydride, inorg. hydrino-containing
 compound with hydrogen polymer 169217-93-0DP, Hydrogen, mol. (H16),
 inorg. hydrino-containing compound, preparation 169217-94-1DP, Hydrogen,
 mol. (H24), inorg. hydrino-containing compound, preparation
 179466-41-2DP, Hydrogen, mol. (H10), inorg. hydrino-containing compound,
 preparation 258858-25-2P, Potassium carbonate hydride
 hydroxide 258880-05-6DP, Hydrogen, ion (H161-), inorg.

- hydrino-containing compound, preparation 258880-32-9DP, Hydrogen, mol. (H60), inorg. hydrino-containing compound, preparation 258880-33-0DP, Hydrogen, mol. (H70), inorg. hydrino-containing compound, preparation
 RL: ARU (Analytical role, unclassified); NUU (Other use, unclassified); SPN (Synthetic preparation); TEM (Technical or engineered material use); ANST (Analytical study); PREP (Preparation); USES (Uses)
 (preparation and uses of hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
- IT 258858-22-9P, Potassium carbonate **hydride** 258858-23-0P, Potassium **hydride** nitrate (K2H(NO₃)) 258858-24-1P, Potassium **hydride** hydroxide (K2H(OH))
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of inorg. **hydride** compound containing hydrino **hydrides**)
- IT 258851-61-5P, Potassium **hydride** iodide (KHI)
 RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
 (preparation of inorg. **hydride** containing hydrino **hydrides**, thermal decomposition, air oxidation/hydrolysis, and characterization by multiple methods)
- IT 258858-21-8P, Potassium carbonate **hydride** (K₂(HCO₃)H)
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of inorg. **hydride**/hydrogen compound containing hydrino **hydrides**)
- L379 ANSWER 81 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2000:91550 Document No. 132:254691 Fabrication and properties of thin ceramic films deposited on porous substrates. Jacobson, Craig P.; Visco, Steven J.; De Jonghe, Lutgard C. (Lawrence Berkeley National Laboratory, University of California, Berkeley, CA, 94720, USA). Ceramic Transactions, 85 (Innovative Processing and Synthesis of Ceramics, Glasses, and Composites), 323-332 (English) 1997. CODEN: CETREW. ISSN: 1042-1122. Publisher: American Ceramic Society.
- AB Bilayers consisting of highly porous substrates and dense thin-films of zirconia, ceria, and perovskite mixed conductors (SrZrO₃, SrCeO₃, and LaSrCoFeO₃) have been successfully fabricated using colloidal deposition techniques. The films are well bonded to the substrate, gas tight, and exhibit little interfacial resistance. Performance of solid oxide fuel cells (SOFCs) based on YSZ electrolytes of less than 10 μm have achieved power densities close to 2 W/cm² at 800°C. Ceria based SOFCs exhibited excellent electrochem. performance over the temperature range of 600 to 800°C with peak power in excess of 650 mW/cm² at 750°C and close to 300 mW/cm² at 600°C. In addition bilayers of thin SrCeO₃ and La_{0.8}Sr_{0.2}Co_{0.8}Fe_{0.2}O₃ (LSCF) suitable for gas separation or membrane reactors have been fabricated and fuel cells based on proton conducting SrZrO₃ films have also been fabricated and tested. The approach is generic and allows deposition of a variety of thin ceramic films on porous substrates. The methodol. is scaleable and inexpensive, and should allow substantial cost-savings in the manufacture and operation of electrochem. devices in the intermediate temperature range of 500-800°C.
- IT 131960-38-8, Strontium yttrium zirconium oxide SrY_{0.05}Zr_{0.95}O₃
 RL: DEV (Device component use); PRP (Properties); USES (Uses)
 (films, electrochem. cells; colloidal deposition fabrication and properties of thin oxide ceramic films deposited on porous substrates)
- RN 131960-38-8 HCAPLUS
 CN Strontium yttrium zirconium oxide (SrY_{0.05}Zr_{0.95}O₃) (9CI) (CA INDEX NAME)

Component		Ratio		Component
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		Registry Number
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 57-2 (Ceramics)
 Section cross-reference(s): 52
 ST oxide film colloidal deposition property porous substrate;
 fuel cell oxide film colloidal deposition property
 porous substrate
 IT Fuel cells
 (solid oxide; colloidal deposition fabrication and properties of
 thin oxide ceramic films deposited on porous substrates)
 IT 118392-69-1, Cobalt lanthanum nickel strontium oxide
 $\text{Co}_{0.98}\text{La}_{0.6}\text{Ni}_{0.02}\text{Sr}_{0.4}\text{O}_3$ 120605-82-5, Lanthanum manganese
 strontium oxide $\text{La}_{0.85}\text{MnSr}_{0.15}\text{O}_3$
 RL: DEV (Device component use); PRP (Properties); USES (Uses)
 (cathode, fuel cell; colloidal deposition
 fabrication and properties of thin oxide ceramic films deposited
 on porous substrates)
 IT 1306-38-3, Cerium oxide (CeO_2), properties 1314-23-4, Zirconium
 oxide (ZrO_2), properties 12036-39-4, Strontium zirconium oxide
 (SrZrO_3) 12267-97-9, Cerate (CeO_{32-}), strontium (1:1)
 64417-98-7, Yttrium zirconium oxide 114902-12-4, Cobalt iron
 lanthanum strontium oxide $\text{Co}_{0.8}\text{Fe}_{0.2}\text{La}_{0.8}\text{Sr}_{0.2}\text{O}_3$ 131960-38-8
 , Strontium yttrium zirconium oxide $\text{SrY}_{0.05}\text{Zr}_{0.95}\text{O}_3$ 206191-10-8,
 Cerium gadolinium oxide ($\text{Ce}_{0.8}\text{Gd}_{0.2}\text{O}_3$)
 RL: DEV (Device component use); PRP (Properties); USES (Uses)
 (films, electrochem. cells; colloidal deposition fabrication and
 properties of thin oxide ceramic films deposited on porous
 substrates)

L379 ANSWER 82 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1999:737354 Document No. 132:17567 Chemical stability and
 proton conductivity of doped $\text{BaCeO}_3\text{-BaZrO}_3$ solid
 solutions. Ryu, Kwang Hyun; Haile, Sossina M. (Materials Science,
 California Institute of Technology, Pasadena, CA, 91125, USA).
 Solid State Ionics, 125(1-4), 355-367 (English) 1999. CODEN:
 SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Barium cerate has a high proton conductivity but rather
 poor chemical stability in CO_2 -containing atms. Barium zirconate, in
 contrast, is a rather stable material but one that exhibits low
 proton conductivity. The conductivity and chemical stability of
 solid solns. between these compds. were studied, in an attempt to
 find a composition exhibiting both high conductivity and good stability.
 Compds. $\text{BaCe}_{0.9-x}\text{Zr}_x\text{M}_{0.103-\delta}$, where M was Gd or Nd and x
 ranged from 0 to 0.4, were prepared by solid state reaction and
 characterized by x-ray powder diffraction, TGA in flowing CO_2 , DTA
 in flowing CO_2 , and a.c. impedance spectroscopy in dry and H_2O -saturated
 argon. Introduction of Zr into doped barium cerate greatly enhanced
 the chemical stability: for the Nd-doped system, compns. with x = 0.2
 or higher did not react with CO_2 (under the exptl., nonequil.
 conditions), whereas for the Gd-doped system, the composition with x =
 0.4 did not react. Not unexpectedly, introduction of Zr also
 decreased conductivity and an increase in the activation energy for proton
 transport. Overall, Nd-doped samples exhibited higher chemical
 stability and lower conductivity than those doped with Gd. The composition
 $\text{BaCe}_{0.7}\text{Zr}_{0.2}\text{Nd}_{0.103-\delta}$ appears to give a good compromise
 between conductivity and stability for fuel cell
 applications.

IT 123998-55-0D, Barium cerium neodymium zirconium oxide
 $(\text{BaCe}_{0.8}\text{Nd}_{0.1}\text{Zr}_{0.103})$, oxygen-deficient 235098-96-1D,
 Barium cerium neodymium zirconium oxide ($\text{BaCe}_{0.7}\text{Nd}_{0.1}\text{Zr}_{0.2}\text{O}_3$),
 oxygen-deficient 235098-98-3D, Barium cerium gadolinium

zirconium oxide ($\text{BaCe0.8Gd0.1Zr0.1O}_3$), oxygen-deficient
 235099-00-0D, Barium cerium gadolinium zirconium oxide
 ($\text{BaCe0.7Gd0.1Zr0.2O}_3$), oxygen-deficient 235099-02-2D,
 Barium cerium neodymium zirconium oxide ($\text{BaCe0.6Nd0.1Zr0.3O}_3$),
 oxygen-deficient 251566-53-7D, Barium cerium neodymium
 zirconium oxide ($\text{BaCe0.5Nd0.1Zr0.4O}_3$), oxygen-deficient
 251566-55-9D, Barium cerium gadolinium zirconium oxide
 ($\text{BaCe0.6Gd0.1Zr0.3O}_3$), oxygen-deficient 251566-57-1D,
 Barium cerium gadolinium zirconium oxide ($\text{BaCe0.5Gd0.1Zr0.4O}_3$),
 oxygen-deficient

RL: PRP (Properties)
 (chemical stability and proton conductivity of doped
 $\text{BaCeO}_3\text{-BaZrO}_3$ solid solns.)

RN 123998-55-0 HCAPLUS
 CN Barium cerium neodymium zirconium oxide ($\text{BaCe0.8Nd0.1Zr0.1O}_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCAPLUS
 CN Barium cerium neodymium zirconium oxide ($\text{BaCe0.7Nd0.1Zr0.2O}_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCAPLUS
 CN Barium cerium gadolinium zirconium oxide ($\text{BaCe0.8Gd0.1Zr0.1O}_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCAPLUS
 CN Barium cerium gadolinium zirconium oxide ($\text{BaCe0.7Gd0.1Zr0.2O}_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

RN 235099-02-2 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.6}Nd_{0.1}Zr_{0.3}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.3	7440-67-7
Ce	0.6	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 251566-53-7 HCPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.5}Nd_{0.1}Zr_{0.4}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Ce	0.5	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 251566-55-9 HCPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.6}Gd_{0.1}Zr_{0.3}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.3	7440-67-7
Gd	0.1	7440-54-2
Ce	0.6	7440-45-1
Ba	1	7440-39-3

RN 251566-57-1 HCPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.5}Gd_{0.1}Zr_{0.4}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Gd	0.1	7440-54-2
Ce	0.5	7440-45-1
Ba	1	7440-39-3

CC 76-2 (Electric Phenomena)

ST barium cerium zirconium oxide proton cond
 stability

IT Electric impedance

Ionic conductors

Stability

X-ray diffraction

(chemical stability and proton conductivity of doped
 BaCeO₃-BaZrO₃ solid solns.)

IT Ionic conductivity

(proton; chemical stability and proton
 conductivity of doped BaCeO₃-BaZrO₃ solid solns.)

IT 12009-21-1, Barium zirconate (BaZrO₃) 12267-77-5, Barium cerium
 oxide (BaCeO₃) 112235-03-7D, Barium cerium neodymium oxide
 (BaCe_{0.9}Nd_{0.1}O₃), oxygen-deficient 123998-55-0D, Barium

cerium neodymium zirconium oxide ($BaCe0.8Nd0.1Zr0.1O_3$), oxygen-deficient 136575-38-7D, Barium cerium gadolinium oxide ($BaCe0.9Gd0.1O_3$), oxygen-deficient 235098-96-1D, Barium cerium neodymium zirconium oxide ($BaCe0.7Nd0.1Zr0.2O_3$), oxygen-deficient 235098-98-3D, Barium cerium gadolinium zirconium oxide ($BaCe0.8Gd0.1Zr0.1O_3$), oxygen-deficient 235099-00-0D, Barium cerium gadolinium zirconium oxide ($BaCe0.7Gd0.1Zr0.2O_3$), oxygen-deficient 235099-02-2D, Barium cerium neodymium zirconium oxide ($BaCe0.6Nd0.1Zr0.3O_3$), oxygen-deficient 251566-53-7D, Barium cerium neodymium zirconium oxide ($BaCe0.5Nd0.1Zr0.4O_3$), oxygen-deficient 251566-55-9D, Barium cerium gadolinium zirconium oxide ($BaCe0.6Gd0.1Zr0.3O_3$), oxygen-deficient 251566-57-1D, Barium cerium gadolinium zirconium oxide ($BaCe0.5Gd0.1Zr0.4O_3$), oxygen-deficient
 RL: PRP (Properties)
 (chemical stability and proton conductivity of doped BaCeO₃-BaZrO₃ solid solns.)

L379 ANSWER 83 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1999:737346 Document No. 131:339430 Aspects of the formation and mobility of protonic charge carriers and the stability of perovskite-type oxides. Kreuer, K. D. (Max-Planck-Institut fur Festkorperforschung, Stuttgart, D-70569, Germany). Solid State Ionics, 125(1-4), 285-302 (English) 1999. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Proton conducting acceptor-doped perovskite-type alkaline earth cerates, zirconates, niobates and titanates have been investigated exptl. and by numerical simulations. For all cubic perovskites the concentration of protonic defects almost reaches the acceptor dopant concentration under appropriate conditions, and the mobility of protonic defects fall into a narrow range. Any symmetry reduction, however, leads to a reduction of the concentration and mobility of protonic defects. For all oxides, dynamical hydrogen bonding is suggested to lead to a local lattice softening, which provides an advantageous environment for high proton-mobility. This effect may explain the very high proton conductivity in covalent acceptor-doped BaZrO₃, which has been found exptl. for the first time. Since this oxide also shows good thermodn. phase stability, it is an interesting candidate as separator material in high-drain electrochem. applications such as fuel cells.

IT 153328-13-3D, Strontium yttrium zirconium oxide ($SrY0.1Zr0.9O_3$), oxygen-depleted 196817-19-3D, Barium calcium niobium oxide ($BaCa0.39Nb0.61O_3$), oxygen-depleted
 RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)

(formation, mobility, and stability of perovskite-type oxides)

RN 153328-13-3 HCAPLUS

CN Strontium yttrium zirconium oxide ($SrY0.1Zr0.9O_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.9	7440-67-7
Y	0.1	7440-65-5
Sr	1	7440-24-6

RN 196817-19-3 HCAPLUS

CN Barium calcium niobium oxide ($BaCa0.39Nb0.61O_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
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O	3	17778-80-2
Ca	0.39	7440-70-2
Ba	1	7440-39-3
Nb	0.61	7440-03-1

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 57, 76

ST perovskite oxide proton conductor stability;
 fuel cell perovskite separator stability

IT Activation energy
 Electric conductors, ceramic
 Electric impedance

Fuel cell separators

Helmholtz free energy

Hydration, chemical

Ionic conductors

Perovskite-type crystals

Stability

(formation, mobility, and stability of perovskite-type oxides)

IT 113876-58-7D, Barium cerium yttrium oxide ($BaCe0.9Y0.1O_3$),
 oxygen-depleted 142487-25-0, Barium tin yttrium oxide ($Ba2SnY05.5$)
153328-13-3D, Strontium yttrium zirconium oxide
 $(SrY0.1Zr0.9O_3)$, oxygen-depleted 158919-45-0D, Cerium strontium
 yttrium oxide ($Ce0.9SrY0.1O_3$), oxygen-depleted 160421-61-4D,
 Barium cerium yttrium oxide ($BaCe0.98Y0.02O_3$), oxygen-depleted
196817-19-3D, Barium calcium niobium oxide
 $(BaCa0.39Nb0.61O_3)$, oxygen-depleted 226087-55-4D, Scandium
 strontium titanium oxide ($Sc0.05SrTi0.95O_3$), oxygen-depleted
 249620-70-0D, Barium scandium titanium oxide ($BaSc0.05Ti0.95O_3$),
 oxygen-depleted 249620-71-1D, Barium yttrium zirconium oxide
 $(BaY0.1Zr0.9O_3)$, oxygen-depleted
 RL: PRP (Properties); TEM (Technical or engineered material use);
 USES (Uses)
 (formation, mobility, and stability of perovskite-type oxides)

L379 ANSWER 84 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1999:415936 Document No. 131:146817 Influence of zirconium
 substitution on the chemical stability and conductivity of
 BaCeO₃-based proton conductors. Ryu, Kwang
 Hyun; Haile, Sossina M. (Materials Science 138-78, California
 Institute of Technology, CA, 91125, USA). Proceedings -
 Electrochemical Society, 98-15(Selected Battery Topics), 485-494
 (English) 1999. CODEN: PESODO. ISSN: 0161-6374. Publisher:
 Electrochemical Society.

AB The impact of zirconium substitution on the conductivity and chemical
 stability of doped barium cerate has been investigated. Compds. of
 general formula $BaCe0.9-xZrxM0.103-\delta$, where M was Gd or Nd and
 x ranged from 0 to 0.4, were characterized by thermal gravimetric
 anal. in flowing CO₂, DTA in flowing CO₂, and impedance spectroscopy
 in dry and H₂O-saturated argon. Introduction of Zr into doped barium
 cerate greatly enhanced the chemical stability: for the Nd-doped
 system, compns. with x = 0.2 or higher did not react with CO₂ (under
 the exptl., nonequil. conditions), whereas for the Gd-doped system,
 the composition with x = 0.4 did not react. Introduction of Zr also led
 to a decrease in conductivity and an increase in the activation energy for
 proton transport. Overall, Nd-doped samples exhibited higher chemical
 stability and lower conductivity than those doped with Gd. The composition
 $BaCe0.7Zr0.2Nd0.103-\delta$, appears to give a good compromise
 between conductivity and stability for fuel cell
 applications.

IT 123998-55-0D, Barium cerium neodymium zirconium oxide
 $BaCe0.8Nd0.1Zr0.1O_3$, oxygen-deficient 235098-96-1D, Barium
 cerium neodymium zirconium oxide ($BaCe0.7Nd0.1Zr0.2O_3$),
 oxygen-deficient 235098-98-3D, Barium cerium gadolinium
 zirconium oxide ($BaCe0.8Gd0.1Zr0.1O_3$), oxygen-deficient
 235099-00-0D, Barium cerium gadolinium zirconium oxide

(BaCe_{0.7}Gd_{0.1}Zr_{0.2}O₃), oxygen-deficient 235099-02-2D,
 Barium cerium neodymium zirconium oxide (BaCe_{0.6}Nd_{0.1}Zr_{0.3}O₃),
 oxygen-deficient
 RL: PRP (Properties)
 (influence of zirconium substitution on chemical stability and conductivity
 of BaCeO₃-based proton conductors)

RN 123998-55-0 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.8}Nd_{0.1}Zr_{0.1}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.7}Nd_{0.1}Zr_{0.2}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.8}Gd_{0.1}Zr_{0.1}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.7}Gd_{0.1}Zr_{0.2}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

RN 235099-02-2 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.6}Nd_{0.1}Zr_{0.3}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2

Zr	0.3	7440-67-7
Ce	0.6	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 76

ST zirconium barium cerium oxide proton conductor;
fuel cell electrolyte proton
conductor

IT Electric conductivity

Fuel cell electrolytes

Ionic conductors

(influence of zirconium substitution on chemical stability and conductivity
of BaCeO₃-based proton conductors)IT 112235-03-7D, Barium cerium neodymium oxide BaCe0.9Nd0.1O₃,
oxygen-deficient 123998-55-0D, Barium cerium neodymium
zirconium oxide BaCe0.8Nd0.1Zr0.1O₃, oxygen-deficient
136575-38-7D, Barium cerium gadolinium oxide BaCe0.9Gd0.1O₃,
oxygen-deficient 235098-96-1D, Barium cerium neodymium
zirconium oxide (BaCe0.7Nd0.1Zr0.2O₃), oxygen-deficient
235098-98-3D, Barium cerium gadolinium zirconium oxide
(BaCe0.8Gd0.1Zr0.1O₃), oxygen-deficient 235099-00-0D,
Barium cerium gadolinium zirconium oxide (BaCe0.7Gd0.1Zr0.2O₃),
oxygen-deficient 235099-02-2D, Barium cerium neodymium
zirconium oxide (BaCe0.6Nd0.1Zr0.3O₃), oxygen-deficient

RL: PRP (Properties)

(influence of zirconium substitution on chemical stability and conductivity
of BaCeO₃-based proton conductors)

L379 ANSWER 85 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1999:388624 Document No. 131:61182 Solid electrolyte

fuel cells for gas leakage prevention. Miyashita,
Tomofumi; Suwahara, Hisashi; Seike, Satoshi; Noguchi, Yoshitaka;
Imasawa, Chieko (Meidensha Electric Mfg. Co., Ltd., Japan). Jpn.
Kokai Tokkyo Koho JP 11162483 A2 19990618 Heisei, 6 pp. (Japanese).
CODEN: JKXXAF. APPLICATION: JP 1997-322562 19971125.

AB In the fuel cells, the solid electrolyte

has a protective layer having conductivity to electron and ion,
and the layer is formed on the H electrode (anode) side.Preferably, the protective layer comprises an oxide having an
O-deficient perovskite-type crystal structure obtained by doping an
oxide containing trivalent (+3) rare earth metal to perovskite
having conductivity to O ion. The protective layer may contain
Ni. Gas leakage caused by crack of the solid electrolyte
is prevented by the protective layer.

IT 201597-70-8P, Strontium yttrium zirconium oxide

RL: DEV (Device component use); MOA (Modifier or additive use); PNU
(Preparation, unclassified); PREP (Preparation); USES (Uses)(fuel cell having O-deficient perovskite-type
oxide as protective layer on anode side of solid
electrolyte for gas leakage prevention)

RN 201597-70-8 HCAPLUS

CN Strontium yttrium zirconium oxide (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	x	17778-80-2
Zr	x	7440-67-7
Y	x	7440-65-5
Sr	x	7440-24-6

IC ICM H01M008-02

ICS H01M008-12

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 76
 ST solid electrolyte protective layer fuel cell; perovskite oxide coating electrolyte fuel cell
 IT Electric conductors
 Ionic conductors
 Perovskite-type crystals
 Solid state fuel cells
 (fuel cell having O-deficient perovskite-type oxide as protective layer on anode side of solid electrolyte for gas leakage prevention)
 IT 1313-99-1, Nickel oxide (NiO), uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (dopant; fuel cell having O-deficient perovskite-type oxide as protective layer on anode side of solid electrolyte for gas leakage prevention)
 IT 54847-17-5P, Magnesium yttrium zirconium oxide 134883-97-9P, Calcium yttrium zirconium oxide 142448-13-3P, Barium cerium yttrium oxide 153728-43-9P, Calcium gadolinium zirconium oxide 158292-98-9P, Barium cerium gadolinium oxide 158292-99-0P, Barium cerium neodymium oxide 158970-15-1P, Cerium samarium strontium oxide 161077-89-0P, Calcium cerium yttrium oxide 163294-84-6P, Barium yttrium zirconium oxide 173353-18-9P, Cerium magnesium yttrium oxide 201597-65-1P, Magnesium neodymium zirconium oxide 201597-66-2P, Calcium neodymium zirconium oxide 201597-68-4P, Neodymium strontium zirconium oxide 201597-70-8P, Strontium yttrium zirconium oxide 228264-87-7P, Gadolinium magnesium zirconium oxide 228264-88-8P, Magnesium scandium zirconium oxide 228264-89-9P, Magnesium samarium zirconium oxide 228264-90-2P, Calcium scandium zirconium oxide 228264-91-3P, Calcium samarium zirconium oxide 228264-92-4P, Gadolinium strontium zirconium oxide 228264-93-5P, Scandium strontium zirconium oxide 228264-94-6P, Samarium strontium zirconium oxide 228264-95-7P, Barium neodymium zirconium oxide 228264-96-8P, Barium gadolinium zirconium oxide 228264-97-9P, Barium scandium zirconium oxide 228264-98-0P, Barium samarium zirconium oxide 228264-99-1P, Cerium magnesium neodymium oxide 228265-00-7P, Cerium gadolinium magnesium oxide 228265-01-8P, Cerium magnesium scandium oxide 228265-02-9P, Cerium magnesium samarium oxide 228265-03-0P, Calcium cerium neodymium oxide 228265-04-1P, Calcium cerium gadolinium oxide 228265-05-2P, Calcium cerium scandium oxide 228265-06-3P, Calcium cerium samarium oxide 228265-07-4P, Cerium strontium yttrium oxide 228265-08-5P, Cerium neodymium strontium oxide 228265-09-6P, Cerium gadolinium strontium oxide 228265-10-9P, Cerium scandium strontium oxide 228265-11-0P, Barium cerium scandium oxide 228265-12-1P, Barium cerium samarium oxide RL: DEV (Device component use); MOA (Modifier or additive use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
 (fuel cell having O-deficient perovskite-type oxide as protective layer on anode side of solid electrolyte for gas leakage prevention)

L379 ANSWER 86 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1998:678199 Document No. 130:17596 Structure and Chemical Composition of a Surfactant-Stabilized Pt₃Sn Alloy Colloid. Boennemann, H.; Britz, P.; Vogel, W. (Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, 45470, Germany). Langmuir, 14(23), 6654-6657 (English) 1998. CODEN: LANGD5. ISSN: 0743-7463. Publisher:
 American Chemical Society.

AB A tetraoctylammonium-stabilized Pt₃Sn colloid with nominal composition Pt₃Sn has been prepared by coredn. of the metal salts. This colloid, which is used in the manufacture of anode catalysts for low-temperature polymer membrane fuel cells, was supported on silica and the structure studied by in situ X-ray diffraction and Debye function anal. Results indicate that the supported colloid is best

described as a highly disordered bimetallic fcc cluster with a particle size of .apprx.1.3 nm. From TEM images a slightly larger size of 1.5 ± 4 nm is derived. Point-resolved EDX (energy-dispersive X-ray spectroscopy) confirms the elemental ratio of 3:1 in the PtSn particles. However, the XRD simulation indicates some deviations from uniform alloy formation. On removal of the stabilizing tetraoctylammonium ligands by heating the samples in He to .apprx.200°C, coalescence of neighboring particles occurs. The new alloy formed consists of a majority of cubic Pt0.81Sn0.19 particles, with average size 3.1 nm, and a minority phase of stoichiometric hexagonal PtSn, 4.4 nm in size. The former phase can be considered as a metastable supersatd. solid solution of Sn in Pt. The two phases are stable even on heating to 375°C for 1.5 h in He.

IT 7772-99-8, Tin dichloride, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)
(structure and chemical composition of a surfactant-stabilized Pt₃Sn alloy colloid)

RN 7772-99-8 HCPLUS

CN Tin chloride (SnCl₂) (8CI, 9CI) (CA INDEX NAME)

Cl—Sn—Cl

CC 66-4 (Surface Chemistry and Colloids)

Section cross-reference(s): 67

IT 7772-99-8, Tin dichloride, reactions 10025-65-7, Platinum dichloride 22560-21-0

RL: RCT (Reactant); RACT (Reactant or reagent)
(structure and chemical composition of a surfactant-stabilized Pt₃Sn alloy colloid)

IT 7631-86-9, Silica, processes

RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(supports; structure and chemical composition of a surfactant-stabilized Pt₃Sn alloy colloid)

L379 ANSWER 87 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN

1998:283066 Document No. 128:310400 LSM-YSZ cathodes for medium-temperature solid oxide fuel cells. Tsai, Tsepin; Barnett, Scott A. (Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208, USA). Proceedings - Electrochemical Society, 97-40(Solid Oxide Fuel Cells), 368-377 (English) 1997. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB The effect of cathode composition, processing, and structure on- the performance of medium-temperature (600-800°) solid oxide fuel cells (SOFCs) is described. The SOFC cathodes were two-phase mixts. of (La_{1-x}Sr_x)_{1-y}MnO₃ (LSM) and yttria-stabilized zirconia (YSZ). The electrolytes were <10 .mu.m thick YSZ, and the anodes were Ni-YSZ with Y-doped CeO₂ interfacial layers. The cathode overpotential was the primary factor limiting cell power densities. Increasing the YSZ volume fraction in LSM-YSZ cathodes from 0 to 60% reduced the low-current area-specific resistance of the cells (in air and humidified hydrogen) from .apprx.3.3 to 0.7 Ω cm² at 750°. The use of LSM with y=0.1 suppressed the formation of zirconate phases during cathode sintering. Optimal cathode porosity was ≈40%. The maximum power densities measured in humidified H₂ and air ranged from .apprx.110 mW/cm² at 600 to 470 mW/cm² at 800°.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Fuel cell cathodes

Solid state fuel cells

(lanthanum strontium manganite/yttria-stabilized zirconia cathodes for medium-temperature solid oxide fuel cells)

IT 1314-36-9, Yttria, uses
 RL: DEV (Device component use); USES (Uses)
 (ZrO₂ stabilized with; lanthanum strontium manganite/yttria-stabilized zirconia cathodes for medium-temperature solid oxide fuel cells)

IT 108916-22-9, Lanthanum manganese strontium oxide La_{0.8}MnSr_{0.2}O₃
 112721-99-0 114168-16-0, Tz-8y 139737-59-0, Lanthanum manganese strontium oxide La_{0.72}MnSr_{0.18}O₃ 188185-44-6, Cerium yttrium oxide Ce_{0.84}Y_{0.32}O_{2.16}
 RL: DEV (Device component use); USES (Uses)
 (lanthanum strontium manganite/yttria-stabilized zirconia cathodes for medium-temperature solid oxide fuel cells)

IT 1314-23-4, Zirconia, uses
 RL: DEV (Device component use); USES (Uses)
 (yttria-stabilized; lanthanum strontium manganite/yttria-stabilized zirconia cathodes for medium-temperature solid oxide fuel cells)

L379 ANSWER 88 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1998:32507 Document No. 128:131285 Heavy-water (D2O) take-up-induced lattice expansion in the high-temperature proton conductor Ba₃Ca_{1.18}Nb_{1.8}209-δ. Papathanassopoulos, Konstantinos; Wenzl, Helmut; Schober, Tilman (Inst. fur Festkorperforschung, Julich, 52425, Germany). Journal of the American Ceramic Society, 80(12), 3278-3280 (English) 1997. CODEN: JACTAW. ISSN: 0002-7820. Publisher: American Ceramic Society.

AB Dimensional changes of the high-temperature proton conductor Ba₃Ca_{1.18}Nb_{1.8}209-δ, when exposed to D2O vapor, were investigated using length-change and precision d. measurements. Such information is essential for possible applications of proton conductors in solid oxide fuel cells and humidity and hydrogen sensors. A linear increase of the sample lengths with increases in the deuterium content was observed. Comparison of the present D2O data with those that were previously obtained for H₂O showed that there was a small isotope effect in the lattice expansion. The fact that the length-change-vs.-hydrogen-isotope-concentration curves were almost isotope independent supported the validity of the take-up reaction according to Wagner classic equation (1996). In regard to this equation, it was found that small islands of silver, palladium, nickel, and platinum act as catalytic promoters of the reaction and lead, for given heavy-water-steam exposure conditions, to an increase of water absorption of up to 100%, when compared with samples without the catalytic surface layers.

IT 158634-63-0D, Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.8}209), oxygen-deficient
 RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (proton conductor; heavy-water (D2O) take-up-induced lattice expansion in high-temperature proton conductor Ba₃Ca_{1.18}Nb_{1.8}209-δ)

RN 158634-63-0 HCAPLUS
 CN Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.8}209) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	9	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

CC 57-2 (Ceramics)

ST Section cross-reference(s): 52, 76
 barium calcium niobate proton conductor
 expansion; heavy water lattice expansion proton
 conductor; niobate proton conductor
 heavy water expansion

IT Electric conductors
 (barium calcium niobate; heavy-water (D2O) take-up-induced
 lattice expansion in high-temperature proton
 conductor Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ})

IT Crystal structure
 (lattice expansion; heavy-water (D2O) take-up-induced lattice
 expansion in high-temperature proton
 conductor Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ})

IT Expansion
 (lattice; heavy-water (D2O) take-up-induced lattice expansion in
 high-temperature proton conductor
 Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ})

IT 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4,
 Platinum, uses 7440-22-4, Silver, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst; heavy-water (D2O) take-up-induced lattice expansion in
 high-temperature proton conductor
 Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ})

IT 158634-63-0D, Barium calcium niobium oxide
 (Ba₃Ca_{1.18}Nb_{1.82}O₉), oxygen-deficient
 RL: PRP (Properties); TEM (Technical or engineered material use);
 USES (Uses)
 (proton conductor; heavy-water (D2O)
 take-up-induced lattice expansion in high-temperature
 proton conductor Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ})

IT 7732-18-5, Water, processes
 RL: MOA (Modifier or additive use); PEP (Physical, engineering or
 chemical process); PROC (Process); USES (Uses)
 (uptake; heavy-water (D2O) take-up-induced lattice expansion in
 high-temperature proton conductor
 Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ})

L379 ANSWER 89 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1998:9778 Document No. 128:50630 Proton-conducting
 cerate ceramics. Pederson, L. R.; Coffey, G. W.; Bates, J. L.;
 Weber, W. J. (Pacific Northwest National Laboratory, Richland, WA,
 99352, USA). Oak Ridge National Laboratory, [Report] ORNL/FMP
 (United States), ORNL/FMP-96/1, Proceedings of the Tenth Annual
 Conference on Fossil Energy Materials, 1996, 311-318 (English) 1996.
 CODEN: ORFMEY.

AB Single-cell solid oxide fuel cells
 were constructed using strontium create as the electrolyte
 and their performance tested. Like certain zirconates, hafnates,
 and tantalates, the cerate perovskites are among a class of solid
 electrolytes that conduct protons at
 elevated temps. Depending on the temperature and
 chemical environment, these ceramics also support electronic
 and oxygen ion currents. A maximum power output of
 ≈100 mW per cm² electrolyte surface area
 was obtained at 900°C using 4% hydrogen as the fuel and air
 as the oxidant. A series of rare earth/ceria/zirconia were prepared
 and their elec. properties characterized. Rare earth dopants
 included ytterbia, yttria, terbia, and europia. Ionic
 conductivities were highest for rare earth/ceria and rare earth
 zirconia compns.; a min. in ionic conductivity for all series
 were found for equimolar mixts. of ceria and zirconia. Cerium
 oxysulfide is of interest in fossil energy applications because of
 its high chemical stability and refractory nature. An alternative
 synthesis route to preparing cerium oxysulfide powders have been
 developed using combustion techniques.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST Section cross-reference(s): 57, 76
 solid oxide fuel cell electrolyte;
 strontium create electrolyte fuel cell
 ; rare earth ceria zirconia ionic cond
 IT Fuel cell electrolytes
 Ionic conductivity
 Solid state fuel cells
 (proton-conducting cerate ceramic
 electrolytes for solid oxide fuel cells
)
 IT 200067-60-3, Cerium ytterbium oxide (Ce0.8Yb2O4.6) 200067-61-4,
 Ytterbium zirconium oxide (Yb2Zr0.8O4.6) 200067-62-5, Cerium
 ytterbium zirconium oxide (Ce0.1Yb2Zr0.7O4.6) 200067-63-6, Cerium
 ytterbium zirconium oxide (Ce0.2Yb2Zr0.6O4.6) 200067-64-7, Cerium
 ytterbium zirconium oxide (Ce0.6Yb2Zr0.2O4.6) 200067-65-8, Cerium
 ytterbium zirconium oxide (Ce0.4Yb2Zr0.4O4.6) 200067-66-9, Cerium
 yttrium oxide (Ce0.8Y2O4.6) 200067-67-0, Yttrium zirconium oxide
 (Y2Zr0.8O4.6) 200067-68-1, Cerium yttrium zirconium oxide
 (Ce0.1Y2Zr0.7O4.6) 200067-69-2, Cerium yttrium zirconium oxide
 (Ce0.2Y2Zr0.6O4.6) 200067-71-6, Cerium yttrium zirconium oxide
 (Ce0.6Y2Zr0.2O4.6) 200067-72-7, Cerium yttrium zirconium oxide
 (Ce0.4Y2Zr0.4O4.6) 200067-73-8, Cerium terbium oxide
 (Ce0.8Tb2O4.6) 200067-74-9, Terbium zirconium oxide (Tb2Zr0.8O4.6)
 200067-75-0, Cerium terbium zirconium oxide (Ce0.1Tb2Zr0.7O4.6)
 200067-76-1, Cerium terbium zirconium oxide (Ce0.2Tb2Zr0.6O4.6)
 200067-77-2, Cerium terbium zirconium oxide (Ce0.6Tb2Zr0.2O4.6)
 200067-78-3, Cerium terbium zirconium oxide (Ce0.4Tb2Zr0.4O4.6)
 200067-79-4, Cerium europium oxide (Ce0.8Eu2O4.6) 200067-80-7,
 Europium zirconium oxide (Eu2Zr0.8O4.6) 200067-81-8, Cerium
 europium zirconium oxide (Ce0.1Eu2Zr0.7O4.6) 200067-82-9, Cerium
 europium zirconium oxide (Ce0.2Eu2Zr0.6O4.6) 200067-83-0, Cerium
 europium zirconium oxide (Ce0.6Eu2Zr0.2O4.6) 200067-84-1, Cerium
 europium zirconium oxide (Ce0.4Eu2Zr0.4O4.6)
 RL: DEV (Device component use); USES (Uses)
 (proton-conducting cerate ceramic
 electrolytes for solid oxide fuel cells
)

L379 ANSWER 90 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1997:740153 Document No. 127:360570 Method of manufacturing composite
 membrane structures comprising a thin metal membrane for
 use in selective diffusion of gases. Bredesen, Rune; Klette,
 Hallgeir (Sintef, Norway; Bredesen, Rune; Klette, Hallgeir). PCT
 Int. Appl. WO 9740914 A1 19971106, 17 pp. DESIGNATED STATES: W:
 AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK,
 EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK,
 LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU,
 SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, AM, AZ,
 BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM,
 DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT,
 SE, SN, TD, TG. (Norwegian). CODEN: PIXXD2. APPLICATION: WO
 1997-NO109 19970425. PRIORITY: NO 1996-1739 19960430.

AB Method for manufacturing a composite membrane structure comprising a thin
 metal membrane, e.g., silver, palladium
 or palladium alloys, for use in selective
 diffusion of gases. The metal for the membranes is
 applied by sputtering and/or vapor deposition to base member having
 low surface roughness in a desired thickness, the
 coating is pulled off from the base member to form a
 membrane, and the metal membrane is placed on a
 supporting substrate. The metal is selected from
 Ag, Pd, and Pd alloys.

IT 7440-05-3, Palladium, uses 7440-22-4,
 Silver, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membranes, supported; for selective separation of gases)

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
 CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM B01D039-10
 ICS B01D053-22
 CC 48-1 (Unit Operations and Processes)
 Section cross-reference(s): 49, 52
 ST gas diffusion metal membrane support;
 silver membrane support sensor; palladium
 alloy membrane support; cylinder metal
 membrane sputtering; vapor deposition metal membrane
 cylinder; silicon metal membrane sputtering; glass
 metal membrane sputtering; quartz metal membrane
 sputtering; oxide metal membrane sputtering
 IT Cylinders
 (base members; in supported metal membrane
 manufacture for selective separation of gases)

IT Nitrides
 Oxides (inorganic), uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (base members; in supported metal membrane
 manufacture for selective separation of gases)

IT Metals, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membranes, supported; for selective separation of gases)

IT Membranes, nonbiological
 RL: TEM (Technical or engineered material use); USES (Uses)
 (metallic, supported; for selective separation of
 gases)

IT Electrodes
 (silver or palladium and palladium
 alloy membranes; for oxygen-conductive or
 hydrogen-conductive electrolytes in
 fuel cells and gas sensors)

IT Gases
 (supported metal membrane manufacture for
 selective separation of)

IT Fuel cells
 Sensors
 (supported thin metal membrane manufacture for)

IT Palladium alloy
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membranes, supported; for selective separation of gases)

IT 7440-21-3, Silicon, uses 14808-60-7, Quartz, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (base members; in supported metal membrane
 manufacture for selective separation of gases)

IT 7440-05-3, Palladium, uses 7440-22-4,
 Silver, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membranes, supported; for selective separation of gases)

IT 1333-74-0P, Hydrogen, preparation
 RL: PUR (Purification or recovery); PREP (Preparation)
 (supported thin metal membrane manufacture for
 purification of)

L379 ANSWER 91 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1997:138492 Document No. 126:227570 Effect of LSM-YSZ cathode on thin-electrolyte solid oxide fuel cell performance. Tsai, Tsepin; Barnett, Scott A. (Department of Materials Science and Engineering, Northwestern University, Evanston, IL, USA). Solid State Ionics, 93(3,4), 207-217 (English) 1997. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier.

AB The effect of cathode composition, processing and structure on the performance of medium-temperature (600-800°) solid oxide fuel cells (SOFCs) is described. The cathodes and phys. supports for the SOFCs were two-phase mixts. of $(La_{1-x}Sr_x)_{1-y}MnO_3$ (LSM) and Yttria-stabilized Zirconia (YSZ), the electrolytes were $<10 \mu m$ thick YSZ, and the anodes were Ni-YSZ with Y-doped CeO₂ interfacial layers. It was found that the cathode overpotential was the primary factor limiting cell power densities during operation with air as the oxidant and humidified hydrogen as the fuel. Increasing the YSZ volume fraction in LSM-YSZ cathodes from 0 to 60% reduced the low-current area-specific resistance of the cells (in air and humidified hydrogen) from .apprx.3.3 to 0.7 Ωcm^2 . The use of LSM with $y = 0.1$ suppressed the formation of zirconate phases during cathode sintering. Optimal cathode porosity was $\approx 40\%$. Decreasing the cathode porosity below $\approx 30\%$ resulted in a mass transport limitation at high current densities due to the small pore size ($<0.5 \mu m$) and large cathode thickness ($\approx 1 mm$). The maximum power densities measured in humidified H₂ and air ranged from .apprx.110 mWcm⁻² at 600 to 470 mWcm⁻² at 800°.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 IT Fuel cell cathodes

(effect of lanthanum strontium manganite/Y2O₃-stabilized ZrO₂ cathode on thin-electrolyte solid oxide fuel cell performance)

IT 188185-44-6, Cerium yttrium oxide (Ce0.84Y0.32O2.16)

RL: DEV (Device component use); USES (Uses)
 (anode interfacial layer; effect of lanthanum strontium manganite/Y2O₃-stabilized ZrO₂ cathode on thin-electrolyte solid oxide fuel cell performance)

IT 112721-99-0

RL: DEV (Device component use); USES (Uses)
 (anodes; effect of lanthanum strontium manganite/Y2O₃-stabilized ZrO₂ cathode on thin-electrolyte solid oxide fuel cell performance)

IT 108916-22-9, Lanthanum manganese strontium oxide La0.8MnSr0.2O3

114168-16-0, Yttrium zirconium oxide (Y0.16Zr0.92O2.08)

139737-59-0, Lanthanum manganese strontium oxide La0.72MnSr0.18O3

188185-43-5, Lanthanum manganese strontium oxide (La0.79MnSr0.19O3)

RL: DEV (Device component use); USES (Uses)

(effect of lanthanum strontium manganite/Y2O₃-stabilized ZrO₂ cathode on thin-electrolyte solid oxide fuel cell performance)

L379 ANSWER 92 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1996:315458 Document No. 124:348141 Solid polymer electrolyte fuel cells and their manufacture. Imahashi, Jinichi; Horiba, Tatsuo (Hitachi Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 08088011 A2 19960402 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-222332 19940919.

AB The fuel cells have a pair of electrodes having gas diffusion layers on the opposite sides of a solid polymer electrolyte membrane and means for supplying reaction gas for the electrodes; where either or both electrodes have a catalyst layer on the electrolyte membrane

side of the gas diffusion layer, and the electrolyte membrane has, at least on 1 side, a copptd. layer containing an active material. The copptd. layer contains at least a C support, an active material, e.g., a Pt group metal loaded on the support, a proton conductor, and a hydrophobic binder. The fuel cells are manufactured by adding a mixture containing a Pt compound, the C support, the proton conductor, and the binder on the top side of a polymer electrolyte membrane in a sealed container; stirring the mixture; adding a reducing agent to the bottom side of the electrolyte membrane; heating the container at a predetd. temperature for a predetd. period to reduce the Pt compound to form the copptd layer on the electrolyte membrane; applying a paste containing C or Pt laded C catalyst powder, the proton conductor, and the hydrophobic binder to form the gas diffusion layers; drying at a predetd. temperature to form the electrodes; and hot pressing.

- IC ICM H01M008-02
 ICS H01M004-86; H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST solid polymer electrolyte fuel cell manuf; copptn catalyst layer fuel cell
 IT Fuel cells (fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
 IT Polyoxyalkylenes, uses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses) (fluorine- and sulfo-containing, ionomers, fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
 IT Fluoropolymers
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses) (polyoxyalkylene-, sulfo-containing, ionomers, fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
 IT Ionomers
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses) (polyoxyalkylenes, fluorine- and sulfo-containing, fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
 IT 7440-06-4, Platinum, uses 7782-42-5, Graphite, uses
 RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses) (fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
 IT 9002-84-0, Ptfe
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses) (fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
 IT 50-00-0, Formalin, reactions 302-01-2, Hydrazine, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent) (reducing agent in manufacture of copptd. layers containing catalyst and

proton conductor and hydrophobic binder on solid polymer electrolyte membranes for fuel cells)

L379 ANSWER 93 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1996:30548 Document No. 124:161486 Advanced electrolytes and synthesis of advanced catalysis and membrane materials. Armstrong, T. R.; Bates, J. L.; Coffey, G. W.; Kingsley, J. J.; Pederson, I. R.; Stevenson, J. W.; Weber, W. J.; Youngblood, G. E. (Pacific Northwest Lab., Richland, WA, 99352, USA). Oak Ridge National Laboratory, [Report] ORNL/FMP (United States), ORNL/FMP--94/1, Proceedings of the Eighth Annual Conference on Fossil Energy Materials, 1994, 89-96 (English) 1994. CODEN: ORFMEY.

AB Mixed conductors in the lanthanum strontium cobalt chromium iron oxide system and protonic conductors in the strontium ytterbium cerate system are being evaluated for possible use in gas separation and purification, as electrolytes and electrodes in solid oxide fuel cells, and as sensors. Recent activities include materials synthesis, sintering behavior studies, and microstructural characterization, development of methods to prepare novel shapes, elec. property characterization, and permeation testing. Single-phase LaSrCoCrFe oxides, being investigated for use as dense oxygen separation membranes, have been prepared by combustion methods. Sintering conditions were developed to obtain full d. The addition of up to 10 mol% chromium, intended to improve the stability in a reducing environment, also significantly enhanced densification via liquid phase sintering. Compns. having a high A-site strontium content (80% or greater) were susceptible to internal cracking during cooling, due to large changes in oxygen stoichiometry. These are highly (mixed) conductive materials, with activation energies for conduction in the 0.08 to 0.17 eV range and conductivities to more than 500 S/cm. Passive oxygen fluxes varied with temperature, composition, and the oxygen concentration gradient. At 1000°, high-purity oxygen fluxes in excess of 1 sccm/cm² surface area of the membrane were observed. Protonic conductivity in the strontium ytterbium cerates was shown to have a large grain boundary component. Protonic conductivity in these materials requires the presence of water, which reacts with oxygen vacancies to yield hydroxyl groups that support proton conduction. Transference nos. were determined for protons, oxygen ions, and electrons as a function of temperature. Protonic conduction dominated in hydrated cerates up to 450°. At higher temps., oxygen ion and electronic conductivity became progressively more important. Hydrogen could be pumped across the cerate membrane by applying a d.c. voltage. At 800°, pure hydrogen fluxes greater than 1 sccm/cm² could be driven across the membrane.

CC 76-2 (Electric Phenomena)

ST Section cross-reference(s): 52

ST electrolyte lanthanum strontium cobalt iron oxide; proton conductor strontium cerium ytterbium oxide; catalyst mixed oxide synthesis; membrane mixed oxide synthesis

IT 110687-91-7D, Cerium Strontium Ytterbium oxide (Ce0.95SrYb0.05O₃), oxygen-deficient 122573-60-8D, Cerium Strontium Ytterbium oxide (Ce0.9SrYb0.1O₃), oxygen-deficient 144438-87-9D, Cerium Strontium Ytterbium oxide (Ce0.85SrYb0.15O₃), oxygen-deficient

RL: PRP (Properties)

(protonic conduction in)

L379 ANSWER 94 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1995:767898 Document No. 123:180363 Supported metal catalyst and its manufacture. Yamaguchi, Motoo; Kobayashi, Kenzo; Matsuo, Hisahide; Uozumi, Shohei (Hitachi Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 07155618 A2 19950620 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-304957 19931206.

AB The catalyst is manufactured by bombarding a C support with ionic or atomic beams to form C-supported metal particles. The catalysts may contain Pt, Au, Ag, Pd, Ru, and/or Rh and promoters containing particles selected from Fe, Ni, Co, Cr, Ir, Ga, Ti, V, and Al. The process uses an ion-implantation apparatus. The catalyst is useful for electrodes for fuel cells, oxidation catalysts for hydrocarbons or CO, etc. The catalyst showed high activity.

IT 7440-05-3, Palladium, uses 7440-22-4, Silver, uses
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

RN 7440-05-3 HCPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT 7440-02-0, Nickel, uses 7440-32-6, Titanium, uses 7440-47-3, Chromium, uses 7440-62-2, Vanadium, uses
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (promoter; high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

RN 7440-02-0 HCPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-32-6 HCPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCPLUS

CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-62-2 HCPLUS

CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM B01J035-02
 ICS B01J021-18; B01J023-40; B01J023-48; B01J023-62; B01J023-64;
 B01J023-66; B01J023-89; B01J037-02; H01M004-88; H01M004-90

CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
 Section cross-reference(s): 51, 52

ST metal catalyst carbon support beam bombardment;
 ion beam metal catalyst manuf; atom beam metal catalyst manuf

IT Fluoropolymers
 RL: TEM (Technical or engineered material use); USES (Uses)
 (adhesive; high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT Atomic beams
 Catalysts and Catalysis
 Ion beams
 (high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT Carbon black, uses
 RL: CAT (Catalyst use); USES (Uses)
 (support, Denkablack; high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT 7440-05-3, Palladium, uses 7440-06-4, Platinum,
 uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses
 7440-22-4, Silver, uses 7440-57-5, Gold, uses
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT 7429-90-5, Aluminum, uses 7439-88-5, Iridium, uses 7439-89-6,
 Iron, uses 7440-02-0, Nickel, uses
 7440-32-6, Titanium, uses 7440-47-3,
 Chromium, uses 7440-48-4, Cobalt, uses 7440-55-3,
 Gallium, uses 7440-62-2, Vanadium, uses
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (promoter; high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT 7440-44-0, Carbon, uses
 RL: CAT (Catalyst use); USES (Uses)
 (support; high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

L379 ANSWER 95 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1995:440321 Document No. 122:269993 Study of radiation-grafted FEP-g-polystyrene membranes as polymer electrolytes in fuel cells. Buchi, Felix N.; Gupta, Bhuvanesh; Haas, Otto; Scherer, Gunther G. (Paul Scherrer Inst., Villigen PSI, CH-5232, Switz.). Electrochimica Acta, 40(3), 345-53 (English) 1995. CODEN: ELCAAV. ISSN: 0013-4686. Publisher: Elsevier.

AB Proton exchange membranes for fuel cell applications were synthesized by pre-irradiation grafting of styrene/divinylbenzene mixts. into poly(fluoroethylene-co-hexafluoropropylene) films and subsequent sulfonation. Grafting of pre-existing films overcomes the problem of shaping the grafted polymer into thin membranes and makes this process a potentially cheap and easy technique for the preparation of solid polymer electrolytes. The grafted membranes were characterized by measuring their ion exchange capacity, swelling, specific resistivity and area

- resistance. Due to their thickness in the range 67-211 μm , some of the membranes have a considerably lower resistance than the most widely used membrane Nafion 117. The short-term and long-term performance of these membranes was investigated in H₂O fuel cells. Thin (<100 μm), highly crosslinked (12% divinylbenzene) membranes show the best performance in the fuel cells. Tests for periods of ≤ 1400 h were performed to examine membrane stability and the degradation of grafted membranes.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38
- IT Fluoropolymers
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (membranes; preparation of membranes of fluoroethylene-hexafluoropropylene polymer radiation-grafted with styrene and divinylbenzene and subsequently sulfonated as polymer electrolytes in fuel cells)
- IT Fuel cells
 (separators, proton exchange; preparation of membranes of fluoroethylene-hexafluoropropylene polymer radiation-grafted with styrene and divinylbenzene and subsequently sulfonated as polymer electrolytes in fuel cells)
- IT 25067-11-2D, Tetrafluoroethylene-hexafluoropropylene copolymer, radiation-grafted with styrene and divinylbenzene, sulfonated
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (crosslinked; preparation of membranes of fluoroethylene-hexafluoropropylene polymer radiation-grafted with styrene and divinylbenzene and subsequently sulfonated as polymer electrolytes in fuel cells)
- IT 100-42-5D, Styrene, fluoroethylene-hexafluoropropylene polymer radiation-grafted with 1321-74-0D, Divinylbenzene, fluoroethylene-hexafluoropropylene polymer radiation-grafted with
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (preparation of membranes of fluoroethylene-hexafluoropropylene polymer radiation-grafted with styrene and divinylbenzene and subsequently sulfonated as polymer electrolytes in fuel cells)

L379 ANSWER 96 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1994:518495 Document No. 121:118495 Potential-Dependent Wetting of Aqueous Solutions on Self-Assembled Monolayers Formed from 15-(Ferrocenylcarbonyl)pentadecanethiol on Gold. Abbott, Nicholas L.; Whitesides, George M. (Department of Chemistry, Harvard University, Cambridge, MA, 02138, USA). Langmuir, 10(5), 1493-7 (English) 1994. CODEN: LANGD5. ISSN: 0743-7463.

AB Aqueous solns. of 0.1 M NaClO₄ (pH 1.5, 10 mM KH₂PO₄) show potential-dependent wetting on self-assembled monolayers (SAMs) formed from 15-(ferrocenylcarbonyl)pentadecanethiol (FcCO(CH₂)₁₅SH; Fc = [η₅-C₅H₅]Fe[η₅-C₅H₅]) adsorbed on Au surfaces. Contact angles (θ) decreased from 71 to 43° ($\Delta \cos \theta = -0.40$) when the elec. potential of the SAM was increased from 0.3 to 0.5 V (vs. a Ag wire reference electrode) and then increased from 43 to 58° when the potential of the SAM was returned to 0.2 V. Repeated cycling between these potentials leads to a progressively decreasing response, as the Fc groups are destroyed by side reactions. Contact angles of aqueous solns. on SAMs formed from CH₃(CH₂)₁₇SH decrease by only 2° (from .apprx. 115 to 113°, $\Delta \cos \theta = 0.05$) over the same range of potentials (J. Sondag-Huethorst and L. Fokkink, 1992). The contrast between the wettability of SAMs terminated with Fc and CH₃ groups suggests that potential-dependent wetting of the former is caused primarily by the electrochem. oxidation of the elec.

neutral, surface-confined Fc to the more polar and plausibly more wettable Fc^+ cation. Linear sweep cyclic voltammetric measurements support this hypothesis. Surfaces of Au patterned with SAMs formed from $\text{FCO}(\text{CH}_2)_{15}\text{SH}$ and $\text{CH}_3(\text{CH}_2)_{15}\text{SH}$ were used to construct a micrometer-scale "gate" that controls the flow of liquid down a surface.

- CC 66-4 (Surface Chemistry and Colloids)
 Section cross-reference(s): 47, 72, 76
- ST micrometer gate surface flow control liq; potential dependent wetting self assembled monolayer; ferrocenylcarbonylpentadecanethiol self assembled monolayer gold electrowetting; electrochem oxidn ferrocenylcarbonylpentadecanethiol monolayer gold wetting
- IT Valves
 (micrometer-scale., electrochem., ferrocenylcarbonylpentadecanethiol self-assembled monolayers on gold as, for flow control of liqs. on surfaces)
- IT 2917-26-2, 1-Hexadecanethiol
 RL: PRP (Properties)
 (self-assembled monolayers, on gold, potential-dependent wetting and micrometer-scale gates for liquid flow on surfaces in relation to)

L379 ANSWER 97 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1994:222481 Document No. 120:222481 Manufacture of membrane-electrode assemblies for electrochemical cells and manufactured assemblies. Swathirajan, Sundararajan; Mikhail, Youssef M. (General Motors Corp., USA). Can. Pat. Appl. CA 2081063 AA 19931004, 49 pp. (English). CODEN: CPXXEB. APPLICATION: CA 1992-2081063 19921021. PRIORITY: US 1992-862691 19920403.

- AB A combination, unitary, membrane **electrolyte** and electrode assembly is provided with a solid polymer **electrolyte** membrane, and 1st and 2nd electrodes at least partly embedded in opposed **surfaces** of the membrane. Each electrode comprises a resp. group of finely divided C particles, very finely divided catalytic particles **supported** on internal and external **surfaces** of these particles, and a **proton-conductive** material mixed with the catalytic and C particles. A 1st group of finely divided C particles forming the 1st electrode has greater H_2O attraction and retention properties and is relatively more hydrophilic and less hydrophobic than a 2nd group of C particles forming the 2nd electrode. In a preferred version, the membrane electrode assembly of the invention is prepared by forming a slurry of **proton-conductive** material and ≥ 1 group of finely divided C particles and very finely divided catalytic particles **supported** on and in the carbon particles. The slurry is applied to the opposed **surfaces** of the membrane, and heated while being pressed to the membrane for a sufficient time and at a **temperature** and compressive load sufficient to embed at least a portion of the particles into the membrane to form the assembly. The invention is applicable to **fuel cells** and electrochem. cells in general.

- IC ICM H01M004-96
 ICS H01M008-10; H01M004-88
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72
- ST electrolyte electrode assembly electrochem cell; fuel cell electrolyte electrode assembly; polymer electrolyte membrane electrode assembly; carbon particle electrode electrolyte assembly
- IT Fuel-cell electrolytes
 (polymer membrane, assembly of electrodes and, manufacture of)
- IT Electrodes
 (fuel-cell, in assembly with polymer membrane)

electrolyte, manufacture of)

L379 ANSWER 98 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1994:81684 Document No. 120:81684 γ -Lithium aluminate and its manufacture for molten carbonate fuel-cell electrolyte matrixes. Yamazaki, Nobuyuki; Negishi, Katsuyuki (Nippon Chemical Ind, Japan). Jpn. Kokai Tokkyo Koho JP 05294614 A2 19931109 Heisei, 6 pp. (Japanese). CODEN: JKXXAF.
 APPLICATION: JP 1992-131620 19920423.

AB The γ -Li aluminate is a fine powder with 1st particle average maximum diameter 0.5 .mu.m, round shape, and BET sp. surface area \geq 5 m²/g. The product is manufactured from fine powdered alumina with BET sp. surface area \geq 10 m²/g and Li₂CO₃ with average particle diameter \leq 10 μ m by mixing uniformly and heating at \geq 800°. The product shows high sp. surface area, heat resistance, and low water absorption.

IC ICM C01F007-04
 ICS H01M008-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST lithium aluminate electrolyte fuel cell

IT Fuel-cell electrolytes
 (matrixes, γ -lithium aluminate manufacture for, for molten-carbonate fuel cells)

IT 554-13-2, Lithium carbonate
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (reaction of, with alumina, γ -lithium aluminate from, for fuel-cell electrolyte matrix)

IT 1344-28-1, Alumina, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (reaction of, with lithium carbonate, γ -lithium aluminate from, for fuel-cell electrolyte matrix)

IT 37220-89-6P, Lithium aluminate
 RL: PREP (Preparation)
 (γ -, electrolyte matrix, for molten-carbonate fuel cells, manufacture of)

L379 ANSWER 99 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1994:58561 Document No. 120:58561 Secondary hydride batteries with storage stability and low-self discharge. Fukunaga, Hiroshi (Hitachi Maxell, Japan). Jpn. Kokai Tokkyo Koho JP 05258748 A2 19931008 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-89598 19920313.

AB The batteries comprise NiO or Ni(OH)₂-containing cathodes, H-absorbing alloy anodes supported with anionic surfactants on their surfaces, and aqueous alkali electrolytes. Preferably, the amts. of the surfactants are 0.01-0.1% to the H-absorbing alloys.

IC ICM H01M004-24
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 46
 IT 2991-51-7, FC 129
 RL: USES (Uses)
 (anionic surfactants, in hydrogen-absorbing alloy anodes for batteries)

L379 ANSWER 100 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1994:40365 Document No. 120:40365 Studies on proton conducting ceramics based on perovskite-type oxides. Iwahara, Hiroyasu; Hibino, Takashi; Yajima, Tamotsu (Sch. Eng., Nagoya Univ., Nagoya, 464-01, Japan). Nippon Kagaku Kaishi (9), 1003-11 (Japanese) 1993. CODEN: NKAKB8. ISSN: 0369-4577.

AB Good proton conducting solids usable at high temperature are applicable to a solid electrolyte for high electrolytic current devices like a fuel

cell, an electrolyzer for hydrogen production, a hydrogen separator, etc., as well as for a high temperature-type chemical sensor. Such materials had been scarcely known until oxide ceramics which have appreciable protonic conduction under hydrogen-containing atmospheric at high temperature were found. They are perovskite-type oxides based on SrCeO₃ or BaCeO₃ in which some trivalent cations are partially substituted for cerium. SrCe_{0.95}Yb_{0.05}O₃- α , BaCe_{0.9}Nd_{0.1}O₃- α , etc., belong to this class of conductors. Later, some zirconate-base sintered oxides also are proton conductors under hydrogen containing atmospheric at high temperature. These oxide ceramics exhibit p-type electronic conduction in an atmospheric free from hydrogen or water vapor. However, when water vapor or hydrogen is introduced to the atmospheric at high temperature, electronic conductivity decreases and protonic conduction appears. When the ceramics are exposed to the hydrogen gas, they become almost pure protonic conductors, the conductivities of which are multi 10⁻² S cm⁻¹ at 1000° and multi 10⁻³ S cm⁻¹ at 600°. Protonic conduction in these solids could be verified by electrochem. permeation of hydrogen across the ceramics. These oxides are unique ionic conductors in respect that they have no host constituents which liberate conducting ion (proton). Using these ceramics as a solid electrolyte, several types of electrochem. devices were demonstrated by way of experiment. Based on the principle of hydrogen concentration cell, hydrogen sensors have put to practical use for molten aluminum in casting process.

IT 131960-38-8D, Strontium yttrium zirconium oxide (SrY_{0.05}Zr_{0.95}O₃), oxygen-deficient

RL: PRP (Properties)

(elec. conductivity of, in hydrogen, hydrogen electrochem. evolution in relation to)

RN 131960-38-8 HCAPLUS

CN Strontium yttrium zirconium oxide (SrY_{0.05}Zr_{0.95}O₃) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 72-2 (Electrochemistry)

Section cross-reference(s): 52, 56, 57, 75, 76

ST hydrogen electroevolution perovskite oxide; cond perovskite oxide proton conductor; crystal structure barium rare earth oxide

IT Rare earth metals, compounds

RL: PRP (Properties)

(barium oxides, lattice parameters and proton transport number for)

IT Electric conductivity and conduction

Electric conductors

(ionic, of perovskite-type oxides, by protons)

IT 110687-91-7D, Cerium strontium ytterbium oxide (Ce_{0.95}SrYb_{0.05}O₃), oxygen-deficient 112235-03-7D, Barium cerium neodymium oxide bace_{0.9}nd_{0.1}O₃, oxygen-deficient 131960-38-8D, Strontium yttrium zirconium oxide (SrY_{0.05}Zr_{0.95}O₃), oxygen-deficient 142107-79-7D, Calcium indium zirconium oxide (CaIn_{0.1}Zr_{0.9}O₃), oxygen-deficient

RL: PRP (Properties)

(elec. conductivity of, in hydrogen, hydrogen electrochem. evolution in relation to)

IT 1333-74-0P, Hydrogen, preparation

RL: PREP (Preparation)

(evolution of, electrochem., perovskite-type oxide proton conducting electrolytes for)

L379 ANSWER 101 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1993:156618 Document No. 118:156618 Use of electrochemical techniques to study the thermodynamic and kinetic properties of palladium-hydrogen and palladium-lithium-hydrogen systems. Falanga, A. (Cent. Doct. Armement, Dir. Rech., Paris, Fr.). Report, Order No. PB91-199323, 51 pp. Avail. NTIS From: Gov. Rep. Announce. Index (U. S.) 1991, 92(2), Abstr. No. 202,564 (French) 1991.

AB The development is described of a fuel cell adapted to the study of hydride properties near room temperature for application to research on the thermodn. and kinetics properties of Pd-H and Pd-Li-H systems. Besides the design of the cell itself, the effect of electrolyte purity, the surface condition and metallurgical structure of the material under study, and its previous activation under H were studied. The electrochem. techniques were extended to higher temps. (400°) using LiCl-KCl eutectic mixts. and applied to the study of metal hydrides and Pd/Li. When the material under study and the electrolyte are correctly coupled, electrochem. methods provide highly useful information on the thermodn. and transport properties of different systems. The titration curves, kinetics properties, and H chemical-diffusion coeffs. of Pd-H and Pd-Li-H systems were all obtained. The advantages of electrochem. techniques over conventional ones include easier use and more rapid results, the ability to explore a broader pressure area with the same equipment, greater sensitivity to low H concns., and nearly simultaneous determination of thermodn. and kinetics properties.

IT 7440-05-3, Palladium, properties
 RL: PRP (Properties)
 (thermodn. and kinetics properties of, in system with hydrogen and without lithium, electrochem. technique in study of)

RN 7440-05-3 HCPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 72-2 (Electrochemistry)
 Section cross-reference(s): 52, 56, 65, 67, 68, 69

ST thermodn kinetic property electrochem technique study; hydrogen palladium system thermodn kinetic property; fuel cell hydride property; lithium potassium chloride electrochem technique hydride

IT Fuel cells
 (hydride properties in relation to)

IT Diffusion
 (of hydrogen in palladium-hydrogen and palladium-lithium-hydrogen systems)

IT Thermodynamics
 (of palladium-hydrogen and palladium-lithium-hydrogen systems, electrochem. techniques in study of)

IT 7439-93-2, Lithium, properties
 RL: PRP (Properties)
 (thermodn. and kinetics properties of palladium system with hydrogen and, electrochem. technique in study of)

IT 1333-74-0, Hydrogen, properties
 RL: PRP (Properties)
 (thermodn. and kinetics properties of palladium system with, with and without lithium, electrochem. study of)

IT 7447-40-7, Potassium chloride, properties

- RL: PRP (Properties)
 (thermodn. and kinetics properties of palladium
 -hydrogen and palladium-lithium-hydrogen systems in
 lithium chloride eutectic with, electrochem. techniques in study
 of)
- IT 7447-41-8, Lithium chloride, properties
 RL: PRP (Properties)
 (thermodn. and kinetics properties of palladium
 -hydrogen and palladium-lithium-hydrogen systems in
 potassium chloride eutectic with, electrochem. techniques in
 study of)
- IT 12648-42-9, Palladium hydride
 RL: PRP (Properties)
 (thermodn. and kinetics properties of, electrochem. technique in
 study of)
- IT 7440-05-3, Palladium, properties
 RL: PRP (Properties)
 (thermodn. and kinetics properties of, in system with hydrogen
 and without lithium, electrochem. technique in study of)

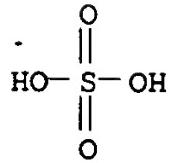
L379 ANSWER 102 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1992:580493 Document No. 117:180493 Electroactive
 hexaammineruthenium(3+) gallery cations in clay-modified electrodes.
 Kaviratna, P. de S.; Pinnavaia, Thomas J. (Cent. Fundam. Mater.
 Res., Michigan State Univ., East Lansing, MI, 48824, USA). Journal
 of Electroanalytical Chemistry, 332(1-2), 135-45 (English) 1992.
 CODEN: JECHE.

AB Ru(NH₃)₆³⁺-laponite and -montmorillonite films supported
 on graphite electrodes exhibited cyclic voltammograms with a
 well-defined Ru(NH₃)₆³⁺/2+ wave even when the complex ion loading
 was less than the cation exchange capacity of the clay film.
 Coulometry indicated that >80% of the Ru(NH₃)₆³⁺ electrostatically
 bound at the cation exchange sites of the gallery surfaces
 was electroactive. Further confirmation of the presence of
 electroactive gallery exchange cations was obtained by comparing the
 electrochem. behavior of the Ru(NH₃)₆³⁺ montmorillonite with
 montmorillonite containing Fe(bpy)₃²⁺ (2,2'-bipyridine) exchange ions
 and [Fe(bpy)₃²⁺] [SO₄²⁻] ion pairs. In this latter system, the
 ion-paired [Fe(bpy)₃²⁺] [SO₄²⁻] centers are electroactive, but the
 gallery Fe(bpy)₃²⁺ exchange cations are rigorously electroinactive.
 The concentration and nature of the cation in the supporting
 electrolyte greatly affected the peak currents of the Ru(NH₃)₆³⁺
 clay, whereas the electroactivity of the [Fe(bpy)₃²⁺] [SO₄²⁻] centers
 were not affected by the electrolyte cation. The decrease in the
 electroactivity of Ru(NH₃)₆³⁺ montmorillonite with increasing
 electrolyte concentration was attributable to the exchange of Ru(NH₃)₆³⁺ by
 electrolyte cations. A mechanism is suggested for maintaining elec.
 neutrality upon electron transfer in these clay films.

IT 10294-54-9, Dicesium sulfate
 RL: PRP (Properties)
 (supporting electrolyte, depletion of electroactivity
 for hexaammineruthenium gallery cation-montmorillonite electrodes
 immersed in solns. of)

RN 10294-54-9 HCAPLUS
 CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



●2 Cs

- CC 72-2 (Electrochemistry)
 Section cross-reference(s): 67
- IT Anodes
 (fuel-cell, montmorillonite-modified graphite
 with electroactive hexaammineruthenium gallery cations)
- IT 19052-44-9, Hexaammineruthenium ion(2+)
 RL: PRP (Properties)
 (redox couple containing, clay-supported)
- IT 7488-54-2, Dirubidium sulfate 7778-80-5, Dipotassium sulfate,
 properties 10294-54-9, Dicesium sulfate 10377-48-7,
 Dilithium sulfate
 RL: PRP (Properties)
 (supporting electrolyte, depletion of electroactivity
 for hexaammineruthenium gallery cation-montmorillonite electrodes
 immersed in solns. of)
- IT 7757-82-6, Disodium sulfate, uses
 RL: USES (Uses)
 (supporting electrolyte, in modifying graphite
 electrodes with clays and electroactive gallery cations)
- IT 127-09-3, Sodium acetate
 RL: PRP (Properties)
 (supporting electrolyte, in modifying graphite
 electrodes with clays and electroactive gallery cations)

L379 ANSWER 103 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1992:87676 Document No. 116:87676 Gas-diffusion electrode assembly for
 use in electrochemical cells. Allen, Robert J. (Metallgesellschaft
 A.-G., Germany). U.S. US 5047133 A 19910910, 7 pp. Cont. of U.S.
 Ser. No. 315,936, abandoned. (English). CODEN: USXXAM.
 APPLICATION: US 1990-545761 19900628. PRIORITY: US 1989-315936
 19890227.

AB The plenum-free gas-diffusion electrode assembly comprises a
 catalyzed C cloth or paper sheet contacting a solid
 metal-supported current collector sheet
 on 1 side (e.g., using a conductive adhesive) and an
 electrolyte-permeable aqueous polymeric hydrogel coating
 on the other side, with the current collector
 sheet provided with gas inlet openings (e.g., for H₂, O₂, or
 air) occupying a minor portion of the surface of the
 current collector sheet. The metal
 support (especially Pb or Pb alloy) comprises a flat
 surface containing a rectilinear narrow gas supply groove
 extending along 1 edge and opening at the surface, a
 supply passage opening through another edge into 1 end of the supply
 groove, a rectilinear narrow discharge groove extending along an
 opposite edge of the support and opening at the
 surface, and an outlet opening through an edge of the
 support into the end of the discharge groove. The openings
 occupy a minor portion of the surface. The electrode is
 used in aqueous solns. for metals recovery, fuel
 cells, batteries, chlorine/alkali cells, and other
 electrochem. cells.

IT 7440-22-4, Silver, uses
 RL: USES (Uses)

(conductive particles, adhesives containing, for gas-diffusion electrodes)
 RN 7440-22-4 HCPLUS
 CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT 7440-50-8P, Copper, preparation
 RL: PREP (Preparation)
 (recovery of, by electrowinning, hydrogen electrodes for)
 RN 7440-50-8 HCPLUS
 CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C25B011-02
 ICS C25C007-00
 INCL 204258000
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 54, 72
 IT Metals, preparation
 RL: PREP (Preparation)
 (recovery of, by electrowinning, hydrogen electrodes for)
 IT Lead alloy, base
 RL: DEV (Device component use); USES (Uses)
 (support, in gas-diffusion electrodes)
 IT 7440-22-4, Silver, uses 7782-42-5, Graphite,
 uses
 RL: USES (Uses)
 (conductive particles, adhesives containing, for gas-diffusion electrodes)
 IT 1333-74-0, Hydrogen, uses
 RL: USES (Uses)
 (electrodes, in recovery of metals by electrowinning)
 IT 7439-96-5P, Manganese, preparation 7440-43-9P, Cadmium,
 preparation 7440-50-8P, Copper, preparation
 7440-66-6P, Zinc, preparation
 RL: PREP (Preparation)
 (recovery of, by electrowinning, hydrogen electrodes for)
 IT 7439-92-1, Lead, uses
 RL: USES (Uses)
 (support, in gas-diffusion electrodes)
 IT 138985-98-5
 RL: DEV (Device component use); USES (Uses)
 (support, in gas-diffusion electrodes)

L379 ANSWER 104 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1992:44143 Document No. 116:44143 Unit cells for solid-electrolyte fuel cells. Fushimi, Kazuo; Kitakizaki, Kaoru; Kawakami, Kazuhiko (Neidensha Corp., Japan). Jpn. Kokai Tokkyo Koho JP 03176966 A2 19910731 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1989-315990 19891205.

AB The cells have successive layers of a perovskite-type O cathode, a 10-20 .mu.m La fluoride solid electrolyte, and group VII metal H anode deposited on a porous metal support. The cells can be operated at 200-500°.

IT 7440-02-0, Nickel, uses
 RL: USES (Uses)
 (anodes, for solid-electrolyte fuel cells)

RN 7440-02-0 HCPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M008-02
 ICS H01M004-86; H01M008-12
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 76
 ST solid electrolyte fuel cell;
 lanthanum fluoride electrolyte fuel
 cell; perovskite oxygen cathode fuel cell
 ; Group VII hydrogen anode fuel cell
 IT Fuel-cell electrolytes
 (lanthanum fluoride, for low-temperature operation)
 IT Cathodes
 (fuel-cell, cobalt lanthanum
 strontium oxide, for low-temperature operation)
 IT Anodes
 (fuel-cell, nickel, for low-
 temperature operation)
 IT Fuel cells
 (solid-state, low temperature operable)
 IT 7440-02-0, Nickel, uses
 RL: USES (Uses)
 (anodes, for solid-electrolyte fuel
 cells)
 IT 110620-52-5, Cobalt lanthanum strontium oxide
 (CoLa0.6Sr0.4O3)
 RL: USES (Uses)
 (cathode, for solid-electrolyte fuel
 cells)
 IT 1314-11-0
 RL: USES (Uses)
 (cathodes, fuel-cell, cobalt
 lanthanum strontium oxide, for low-temperature
 operation)
 IT 13709-38-1, Lanthanum trifluoride
 RL: USES (Uses)
 (electrolyte, for fuel cells)
 IT 11134-23-9, SUS316L
 RL: USES (Uses)
 (fuel cells with porous support of,
 solid-electrolyte)

L379 ANSWER 105 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1991:535567 Document No. 115:135567 Process for preparation of partial
 oxidation products of alicyclic compounds in oxygen-hydrogen
 fuel cell-type reactor. Otsuka, Kyoshi; Yamanaka,
 Ichiro (Mitsui Toatsu Chemicals, Inc., Japan). Jpn. Kokai Tokkyo
 Koho JP 03123746 A2 19910527 Heisei, 7 pp. (Japanese). CODEN:
 JKXXAF. APPLICATION: JP 1989-261494 19891006.

AB Alicyclic compds., i.e. alicyclic alcs. and ketones, are prepared by
 contacting one catalytic electrode (cathode) with a H-donor, i.e. H,
 and the other catalytic electrode (anode) with O and an alicyclic
 compound in a fuel cell system using an
 ion conductor (illustration given). The catalytic
 electrode preferably comprises ≥1 metal component
 or elec. conducting material selected from Group 1-8A and 1-6B
 metals or metal compds., i.e. metal
 halides, nitrates, sulfates, oxides, hydroxides, phosphates, or
 ammonium salts. The process simultaneously can generate
 elec. power. Thus, 40 mL cyclohexane was placed in the cathode
 chamber of a fuel cell-type reactor having a
 sheet of an anode which is formed by hot-pressing Pt black powder,

graphite powder, and teflon powder, and a sheet of a cathode similarly prepared from Pd black, graphite powder, and teflon powder, while separating the electrodes by a silica wool disk impregnated with 85% aqueous H₃PO₄ which serves as an ion conductor. The cathode and anode were connected by an conducting wire to form a closed circuit and to the cathode chamber O at 10 mL/min was introduced while to the anode chamber H containing 2.67 volume % H₂O at 21 mL/min was fed to give, after 20 h at 25°, 5.8 μmol cyclohexanol and 10.2 μmol cyclohexanone with 4.30 mF elec. current generated.

IT 7772-99-8, Tin(II) chloride, uses and miscellaneous

RL: USES (Uses)
(cathode containing graphite and palladium and, for electrochem. oxidation of cyclohexane in fuel cell reactor)

RN 7772-99-8 HCPLUS

CN Tin chloride (SnCl₂) (8CI, 9CI) (CA INDEX NAME)

Cl—Sn—Cl

IT 7440-05-3, Palladium, uses and miscellaneous

RL: USES (Uses)
(cathode containing graphite and, for electrochem. oxidation of cyclohexane in fuel cell reactor)

RN 7440-05-3 HCPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C07C027-12

ICS B01J035-02; C07C029-50; C07C035-08; C07C045-33; C07C049-403;
C25B005-00; H01M004-90; H01M008-22

ICA B01J027-10; B01J027-24; C07B061-00

CC 24-5 (Alicyclic Compounds)

Section cross-reference(s): 72

ST alicyclic compd electrochem oxidn; fuel cell

reactor electrochem oxidn; cycloalkane electrochem oxidn;
cyclohexane electrochem oxidn

IT Rare earth chlorides

RL: RCT (Reactant); RACT (Reactant or reagent)
(cathodes containing palladium and graphite and, for electrochem.
oxidation of cyclohexane on fuel cell reactor)

IT Fuel cells

(electrochem. oxidation by, of alicyclic compds. to alicyclic alcs.
and ketones)

IT Alicyclic compounds

RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of, to alicyclic alcs. and ketones, in
fuel cell-type reactor)

IT Oxidation, electrochemical

(of alicyclic compds. to alicyclic alcs. and ketones, in
fuel cell-type reactor)

IT Alcohols, preparation

Ketones, preparation

RL: SPN (Synthetic preparation); PREP (Preparation)
(alicyclic, preparation of, by electrochem. oxidation of alicyclic
compds. using fuel cell-type electrodes)

IT 7440-06-4, Platinum, uses and miscellaneous

RL: USES (Uses)
(anode containing graphite and, for electrochem. oxidation of
cyclohexane in fuel cell reactor)

IT 7447-39-4, Copper(II) chloride, uses and miscellaneous 7447-40-7,
Potassium chloride, uses and miscellaneous 7447-41-8, Lithium

chloride, uses and miscellaneous 7646-79-9, Cobalt(II) chloride, uses and miscellaneous 7646-85-7, Zinc(II) chloride, uses and miscellaneous 7647-14-5, Sodium chloride, uses and miscellaneous 7647-17-8, Cesium chloride, uses and miscellaneous 7705-08-0, Iron(III) chloride, uses and miscellaneous 7718-54-9, Nickel chloride, uses and miscellaneous 7772-99-8, Tin(II) chloride, uses and miscellaneous 7773-01-5, Manganese chloride 7786-30-3, Magnesium chloride, uses and miscellaneous 7790-86-5, Cerium chloride 7791-11-9, Rubidium chloride, uses and miscellaneous 7803-55-6 10024-93-8, Neodymium chloride 10025-74-8, Dysprosium chloride 10025-76-0, Europium chloride 10042-88-3, Terbium chloride 10043-52-4, Calcium chloride, uses and miscellaneous 10049-08-8, Ruthenium(III) chloride 10099-58-8, Lanthanum chloride 10099-66-8, Lutetium chloride 10138-41-7, Erbium chloride 10138-52-0, Gadolinium chloride 10138-62-2, Holmium chloride 10361-37-2, Barium chloride, uses and miscellaneous 10361-79-2, Praseodymium chloride 10361-82-7, Samarium chloride 10361-84-9, Scandium chloride 10361-91-8, Ytterbium chloride 10361-92-9, Yttrium chloride 10476-85-4, Strontium chloride 12027-67-7 13537-18-3, Thulium chloride 16903-35-8

RL: USES (Uses)
(cathode containing graphite and palladium and, for electrochem. oxidation of cyclohexane in fuel cell reactor)

IT 7440-05-3, Palladium, uses and miscellaneous

RL: USES (Uses)
(cathode containing graphite and, for electrochem. oxidation of cyclohexane in fuel cell reactor)

IT 7782-44-7, Oxygen, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of alicyclic compds. with hydrogen and, in fuel cell-type reactor)

IT 1333-74-0, Hydrogen, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of alicyclic compds. with oxygen and, in fuel cell reactor)

IT 110-82-7, Cyclohexane, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of, to cyclohexanol and cyclohexanone, in fuel cell reactor)

IT 108-93-0P, Cyclohexanol, preparation 108-94-1P, Cyclohexanone, preparation

RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of, by electrochem. oxidation of cyclohexane, in fuel cell-type reactor)

L379 ANSWER 106 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1989:636622 Document No. 111:236622 Proton-conductive solid electrolyte. Makino, Tasuke; Matsuhiro, Yasushi (Nippondenso Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 01087510 A2 19890331 Heisei, 3 pp. (Japanese). CODEN: JKXXAF.

APPLICATION: JP 1987-245269 19870929.

AB The title **electrolyte** is a BaO-Ce oxide-based compound oxide containing ≥ 1 oxide of Y, Sc, Yb, Nd, Mg, Pr, and Zn with part of Ce substituted by an element having a bonding strength to O ion weaker than Ce. The element can be Zr, Ti, Hf, Si, Ge, Pb, and/or Sn. Thus, $BaCe0.8Zr0.1Nd0.103-x$ was prepared by sintering a mixture of $BaCO_3$, CeO_2 , ZrO_2 , and Nd_2O_3 . This **electrolyte** showed high conductivity with low-temperature dependence at 670-870°. The **electrolyte** can be used for fuel cells and sensors.

IT 123998-55-0D, Barium cerium neodymium zirconium oxide ($BaCe0.8Nd0.1Zr0.103$), oxygen-deficient

RL: USES (Uses)
(electrolyte, proton-conductive, for fuel cells and sensors)

RN 123998-55-0 HCAPLUS
 CN Barium cerium neodymium zirconium oxide ($BaCe0.8Nd0.1Zr0.1O_3$) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

IC ICM C01B035-00
 ICS C01F017-00; H01B001-08
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72
 ST proton conductive solid oxide
 electrolyte; barium cerium oxide solid electrolyte
 ; zirconium barium cerium oxide electrolyte; neodymium
 barium cerium oxide electrolyte; fuel
 cell solid oxide electrolyte; electrochem sensor
 solid oxide electrolyte
 IT Fuel cells
 (solid electrolytes for, barium cerium oxide-based
 proton-conductive)
 IT 123998-55-0D, Barium cerium neodymium zirconium oxide
 ($BaCe0.8Nd0.1Zr0.1O_3$), oxygen-deficient
 RL: USES (Uses)
 (electrolyte, proton-conductive,
 for fuel cells and sensors)
 IT 1309-48-4, Magnesium oxide (MgO), uses and miscellaneous
 1310-53-8, Germanium oxide (GeO_2), uses and miscellaneous
 1313-97-9, Neodymium oxide (Nd_2O_3) 1314-13-2, Zinc oxide (ZnO),
 uses and miscellaneous 1314-23-4, Zirconium oxide (ZrO_2), uses and
 miscellaneous 1314-36-9, Yttrium oxide (Y_2O_3), uses and
 miscellaneous 1314-37-0, Ytterbium oxide (Yb_2O_3) 1332-29-2, Tin
 oxide 1335-25-7, Lead oxide 7631-86-9, Silica, uses and
 miscellaneous 12036-32-7, Praseodymium oxide (Pr_2O_3) 12055-23-1,
 Hafnium oxide (HfO_2) 13463-67-7, Titanium oxide (TiO_2), uses and
 miscellaneous 37200-34-3, Scandium oxide
 RL: USES (Uses)
 (solid electrolytes containing, barium cerium oxide-based
 proton-conductive, for fuel
 cells and sensors)

L379 ANSWER 107 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1989:617218 Document No. 111:217218 Anodes for high-
 temperature fuel cells. Hado, Kazuhito; Niikura, Junji;
 Taniguchi, Noboru; Gamo, Koji; Moriwaki, Yoshio; Iwaki, Tsutomu
 (Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai
 Tokkyo Koho JP 01167957 A2 19890703 Heisei, 3 pp. (Japanese).
 CODEN: JKXXAF. APPLICATION: JP 1987-328545 19871224.

AB H-absorbing alloy or metal hydrides containing Zr
 are used as the anodes. The anodes may contain Ni, or
 ≥ 1 of Ti, V, Cr, Mn, Fe
 , Co, Cu, Nb, Mo, W, Al, Mg, Ca and Sr. The anodes may be
 coated with Ni, Cu, Al, Cr,
 Co, Pd, and/or Pt, or with ceramics. High performance of
 fuel cells is obtained. Thus, Zr-Cu
 alloy was pulverized, coated with Ni, mixed with
 Ni carbonyl, pressed and heated to working temperature
 A fuel cell using this anode, Li-doped
 Ni oxide as cathode, and 62:38 (mol ratio) $Li_2CO_3-K_2CO_3$
 mixture as electrolyte was operated at 650° and
 showed excellent performance.

IT 7439-89-6, Iron, uses and miscellaneous
7440-02-0, Nickel, uses and miscellaneous
7440-32-6, Titanium, uses and miscellaneous
7440-47-3, Chromium, uses and miscellaneous
7440-50-8, Copper, uses and miscellaneous
7440-62-2, Vanadium, uses and miscellaneous
RL: DEV (Device component use); USES (Uses)
(anodes containing, for high-temperature hydrogen fuel cells)
RN 7439-89-6 HCPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-32-6 HCPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IT 7440-05-3, Palladium, uses and miscellaneous
RL: USES (Uses)
(coatings, on anodes for high-temperature hydrogen
fuel cells)
RN 7440-05-3 HCPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-86
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST hydrogen fuel cell high temp; zirconium alloy fuel cell
anode
IT Ceramic materials and wares

(coatings, on anodes for high-temperature hydrogen fuel cells)

IT Anodes
 (fuel-cell, zirconium alloys and metal hydrides, for high-temperature hydrogen fuel cells)

IT 7429-90-5, Aluminum, uses and miscellaneous 7439-89-6, Iron, uses and miscellaneous 7439-95-4, Magnesium, uses and miscellaneous 7439-96-5, Manganese, uses and miscellaneous 7439-98-7, Molybdenum, uses and miscellaneous 7440-02-0, Nickel, uses and miscellaneous 7440-03-1, Niobium, uses and miscellaneous 7440-24-6, Strontium, uses and miscellaneous 7440-32-6, Titanium, uses and miscellaneous 7440-33-7, Tungsten, uses and miscellaneous 7440-47-3, Chromium, uses and miscellaneous 7440-48-4, Cobalt, uses and miscellaneous 7440-50-8, Copper, uses and miscellaneous 7440-62-2, Vanadium, uses and miscellaneous 7440-70-2, Calcium, uses and miscellaneous 11101-28-3

RL: DEV (Device component use); USES (Uses)
 (anodes containing, for high-temperature hydrogen fuel cells)

IT 11134-36-4
 RL: USES (Uses)
 (anodes, hydrogen-absorbing, nickel in, for high-temperature hydrogen fuel cells)

IT 123697-77-8
 RL: USES (Uses)
 (anodes, hydrogen-absorbing, nickel-copper alloys in, for high-temperature hydrogen fuel cells)

IT 7440-05-3, Palladium, uses and miscellaneous 7440-06-4, Platinum, uses and miscellaneous
 RL: USES (Uses)
 (coatings, on anodes for high-temperature hydrogen fuel cells)

L379 ANSWER 108 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1981:211497 Document No. 94:211497 Metal hydride
 fuel cells: a feasibility study and perspectives for vehicular applications. Folonari, C.; Iemmi, G.; Manfredi, F.; Rolle, A. (FIAT Res. Cent., Turin, Italy). Journal of the Less-Common Metals, 74(2), 371-8 (English) 1980. CODEN: JCOMAH. ISSN: 0022-5088.

AB Several alloys of the LaNi₅ [12196-72-4] family were tested to evaluate their thermochem. and electrochem. properties using repeated H absorption-desorption cycling. The alloys show good electrochem. properties, fast discharging and recharging kinetics, and high H absorption. On the basis of exptl. results and theor. evaluations, the realization of new types of fuel cells characterized by hydride electrodes and a solid electrolyte is tech. feasible. In addition to the advantages of conventional fuel cells, a compact simple structure with a high energy d. can be obtained; the application of this structure to the propulsion of elec. vehicles could product significant improvements in reliability and performance compared with conventional and advanced secondary batteries.

IT 12196-72-4
 RL: DEV (Device component use); USES (Uses)
 (for anodes, fuel-cell, properties of)

RN 12196-72-4 HCPLUS
 CN Lanthanum, compd. with nickel (1:5) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ni	5	7440-02-0
La	1	7439-91-0

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 56
 ST metal hydride fuel cell; lanthanum
 nickel hydride fuel cell
 IT Fuel cells
 (metal hydride)
 IT 12196-72-4 12213-73-9 62699-62-1
 RL: DEV (Device component use); USES (Uses)
 (for anodes, fuel-cell, properties of)

L379 ANSWER 109 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1971:9070 Document No. 74:9070 Manufacture of Raney catalyst-containing electrodes. Doetzer, Richard; Kohlmueller, Hans (Siemens A.-G.). Ger. Offen. DE 1909031 19700910, 14 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1969-1909031 19690222.

AB The invention describes the manufacture of high activity Raney catalyst containing electrodes for electrochem. cells, especially fuel cells having reactants dissolved in the electrolyte. Al is electrodeposited on a metallic support using an electrolyte of the general formula MX.2AlR₃, where M is a Na, K, or onium ion, X is a halogen or cyanide, and R is an alkyl residue containing 1-12 C atoms; the temperature is pref. 80-120°, the c.d. 1-20 mA/cm², and the voltage 1.5-12 V. After deposition, a Raney alloy is produced by diffusion at 350-650°. The diffused Al is removed by an aqueous solution of either an alkali metal hydroxide or an alkyl halide. The metallic support material can be in sheet form, porous or nonporous foil, porous sintered solids, or a mesh. Suitable metals are: Ni, Co, W, Ag or their alloys.
 IT 7440-02-0, uses and miscellaneous
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, fuel-cell, Raney type)
 RN 7440-02-0 HCPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 77 (Electrochemistry)
 ST Raney catalysts electrodes fuel cells; catalysts
 Raney electrodes fuel cells; electrodes Raney
 catalysts fuel cells; fuel
 cells Raney catalysts electrodes
 IT Fuel cells
 (electrodes, Raney catalyst for)
 IT Electrodes
 (fuel-cell, Raney catalyst for)
 IT 7440-02-0, uses and miscellaneous 7440-48-4, uses and
 miscellaneous
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, fuel-cell, Raney type)

L379 ANSWER 110 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1969:497758 Document No. 71:97758 Fuel-cell
 electrodes. Vanleugenhaghe, Claude (Societe d'Etudes, de Recherches et d'Applications pour l'Industries S.E.R.A.I.). Ger. Offen. DE 1904768 19690904, 15 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1969-1904768 19690131.

AB A method is given for improving the capacity of fuel-cell electrodes consisting of a mixture of C, catalyst, and polymeric fluorohydrocarbon binder on metallic support. The electrode is treated with alkali

metals dissolved in liquid NH₃, methylamine, or naphthalene plus tetrahydrofuran. Only the side exposed to the electrolyte may be treated with alkali metal hydrides or borohydrides followed by heating at <350°. The electrode can also be treated with alkali metal vapors or melts. Thus, an electrode consisting of 200-μ film of 5.25% poly(tetrafluoroethylene) and 94.75% mixture of 8 parts active C, 10 parts Pt, and 10 parts Pd on a Ni support is immersed for 75 sec. in a solution of 400-mg. Na in 300-ml. liquid NH₃ and dried in air. An H₂-O₂ cell with 5N KOH electrolyte and the prepared electrode has a voltage of 1000-854 mv. at a c.d. 0-300 ma./cm.² at 70° as compared to 1100-826 mv. for a cell with 50% KOH electrolyte and Halderman electrode containing 40 mg. Pt/cm.² and operating at 100°.

IC H01M

CC 77 (Electrochemistry)

ST fuel cell electrodes; electrodes fuel cell

IT Fuel cells

(electrodes, Teflon-bonded, impregnated with alkali metals and calcium)

IT Electrodes

(fuel-cell, Teflon-bonded, impregnated with alkali metals and calcium)

IT Alkali metals, uses and miscellaneous

RL: USES (Uses)

(impregnation with, of teflon bonded fuel-cell electrode)

IT 7439-93-2, uses and miscellaneous 7440-23-5, uses and miscellaneous 7440-70-2, uses and miscellaneous

RL: USES (Uses)

(impregnation with, of teflon bonded fuel-cell electrode)

L379 ANSWER 111 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1969:487163 Correction of: 1969:435501 Document No. 71:87163
 Correction of: 71:35501 Electrodes for electrochemical fuel cells. (Leesona Corp.). Brit. GB 1151787 19690514, 3 pp.
 (English). CODEN: BRXXAA. PRIORITY: US; 19650930.

AB An O electrode for fuel cells was fabricated by coating a porous metal support (0.5-1 mm. thick, mesh size 50-150) of Ni, Cu, Fe, Ta, Zr, Au, Ag, or their alloys with a dispersion of 55-90% Co and (or) Ni or Co-activated Ni and 10-45% hydrophobic polymer [such as poly(tetrafluoroethylene), polyethylene, or polystyrene], drying in air at 50-95° under slight pressure, and sintering for 5-35 min. at 220-300°. Thus, a 100-mesh Ni screen was sprayed with a dispersion of 15% poly(tetrafluoroethylene) and 85% 1:1 Co-Ni, dried for 10 min. at 85°, and after rolling, sintered at 250° for 6 min. When used as a cathode in a half-cell with 65% KOH electrolyte and with air as fuel at 150°, the electrode voltage was 0.91-0.98 v. and c.d. 100-300 ma./cm.²

IC H01M

CC 77 (Electrochemistry)

ST electrodes fuel cells; fuel cells electrodes; cells fuel electrodes; oxygen electrode fuel cells

IT Fuel cells

(electrodes, cobalt-nickel in teflon dispersion on nickel screen)

IT Electrodes

(fuel-cell, oxygen, cobalt-nickel in teflon dispersion on nickel screen)

IT 7440-48-4, uses and miscellaneous
 RL: USES (Uses)
 (electrodes with nickel, fuel-cell)
 IT 7782-44-7, uses and miscellaneous
 RL: USES (Uses)
 (electrodes, fuel-cell)
 IT 9002-84-0, uses and miscellaneous
 RL: USES (Uses)
 (in fuel-cell electrodes, with cobalt-nickel mixture)

L379 ANSWER 112 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1969:466734 Document No. 71:66734 Nonstoichiometric boron carbide as a catalyst support for fuel-cell electrodes. (General Electric Co.). Brit. GB 1157124 19690702, 12 pp. (English).
 CODEN: BRXXAA. PRIORITY: US; 19651001.

AB C (e.g. graphite) containing dissolved B is a suitable support material for fuel-cell electrodes (especially anodes), fulfilling the requirements of being electronically conducting and of having a high resistance to electrochem. oxidation and to attack by strong acids and alkalis, and also enhancing the catalytic activity, yielding a more effective electrode than conventional support materials (e.g. C, Ta). The maximum solubilities of B in graphite at temps. .apprx.2200° are known (.apprx.2 weight % B) (R. V. Sara, et al., CA 60: 8967g); further added B combines chemical. There is a greater increase in performance in material comprising B dissolved in C plus B carbide as a 2nd phase. When stoichiometric B carbide (I) (80 atomic % B) alone is used, the performance is poor. I is believed to have a unit cell of $B_{12}C_3$ with the B atoms at the vertices of a regular icosahedron with the C atoms as linear units of 3 atoms each. High purity I has a relatively high powder resistivity (.apprx.8000 ohm-cm.) but this decreases as the amount of C is increased, especially at and above 30 atomic % C. The superior performance of the nonstoichiometric boron carbide (II) is due to the relation between the B carbide crystals and the excess C in the form of graphite crystals containing B. One com. preparation of I and II has been described by Ridgway (CA 28: 71676). The metal catalyst (preferably of noble metals of Groups VIII and IB) is prepared by thermally decomposing a halogen-free salt (e.g. $Pt(NH_3)_2(NO_2)_2$ or $AgOAc$) on the support, to produce metal surfaces of area at least 20 m.2/g. A suitable fuel cell construction is described in Brit. 1,043,127. The electrode may be prepared by spreading a paste of catalyst-bearing II (particle size <400 mesh, i.e. able to pass through a mesh of 400 holes/lineal inch) and poly-(tetrafluoroethylene) (PTFE) powder suspended in water on a current collector mesh screen, consolidating under light pressure, and heating to 350-400°, to allow the PTFE binder to fuse the mixture into a coherent porous mass. The binder should be 10-30 weight % of the total mixture; the catalyst concentration should be 0.1-50 weight % of the support material. For example, 0.500 g. of 800 mesh (8-12 μ) II containing 4.8 weight % Pt was mixed with 0.96 ml. of a suspension containing 0.8 ml. of water and 0.16 ml. of a 60% solids PTFE suspension. The resulting paste was spread directly on a 17/8-in. diameter Pt screen (45 + 45 mesh, 0.0078 in. wire diameter) so that the paste extended through the screen mesh. After smoothing, the structure was fused at 350° for 2 min. A hydrophobic film was applied on one side by spraying a water-diluted PTFE suspension to form a film of 6 mg./cm.2 and then heating at 350° for 2 min. The performances of fuel cells with anodes prepared as described and with standard Pt cathodes, were tested for different support materials and shown to be best with II containing 60% B.

IT 7440-05-3, uses and miscellaneous
 RL: CAT (Catalyst use); USES (Uses)

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC H01M
 CC 77 (Electrochemistry)
 IT Fuel cells
 (electrodes, catalytic, with nonstoichiometric boron carbide support)
 IT Electrodes
 (fuel-cell, catalytic, with nonstoichiometric boron carbide support)
 IT Boron carbide
 RL: PRP (Properties)
 (fuel-cell catalyst support from nonstoichiometric)
 IT 7440-02-0, uses and miscellaneous 7440-05-3, uses and
 miscellaneous 7440-06-4, uses and miscellaneous
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, fuel-cell, in nonstoichiometric boron carbide support)

L379 ANSWER 113 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1969:435501 Document No. 71:35501 Electrodes for electrochemical
 fuel cells. (Leesona Corp.). Brit. GB 1151787
 19690514, 3 pp. (English). CODEN: BRXXAA. PRIORITY: US; 19650930.

AB An O electrode for fuel cells was fabricated by
 coating a porous metal support (0.5-1
 mm. thick, mesh size 50-150) of Ni, Cu,
 Fe, Ta, Zr, Au, Ag, or their alloys with
 a dispersion of 55-90% Co and (or) Ni or Co-activated
 Ni and 10-45% hydrophobic polymer (such as
 polytetrafluoroethylene, polyethylene, or polystyrene), drying in
 air at 50-95° under slight pressure, and sintering for 5-35
 min. at 220-300°. Thus, a 100-mesh Ni screen was
 sprayed with a dispersion of 15% polytetrafluoroethylene and 85%
 Co-Ni (1:1), dried for 10 min. at 85°, and after
 rolling, sintered at 250° for 6 min. When used as a cathode
 in a half-cell with 65% KOH electrolyte and with air as
 fuel at 150°, the electrode voltage was 0.91-0.98 v
 . and c.d. 100-300 ma./cm.2

IC H01M
 CC 77 (Electrochemistry)
 ST fuel cells electrodes; electrodes fuel
 cells; nickel fuel cells
 electrodes
 IT Fuel cells
 (cathodes, cobalt-nickel, in tetrafluoroethylene
 polymer matrix)
 IT Cathodes
 (fuel-cell, cobalt-nickel, in
 tetrafluoroethylene polymer matrix)
 IT 9002-84-0, uses and miscellaneous
 RL: USES (Uses)
 (fuel-cell cathodes from cobalt-
 nickel and)
 IT 7440-48-4, uses and miscellaneous
 RL: USES (Uses)
 (fuel-cell cathodes from nickel
 and, in tetrafluoroethylene polymer matrix)

L379 ANSWER 114 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1968:432509 Document No. 69:32509 Hydrogenation catalyst. Jung, Margarete; Kroeger, Hanns H. (Varta A.-G.). U.S. US 3382106 19680507, 7 pp. (English). CODEN: USXXAM. APPLICATION: US 1965-485573 19650907.

AB Catalysts useful for H transfer reactions, especially those occurring in fuel cells, are prepared by saturating with H an alkali-resistant, crystalline metal from Group IVB, VB, VIB, VIII, or Pt. The metal is impregnated with a 10-3 weight % aqueous alkaline solution of a strong reducing agent such as a complex metal hydride, hydrazine and its salts, or hydroxylamine and its salts, at 10-60°. The process is terminated when gaseous H is evolved. The process may also be used for reactivating spent catalyst. For example, 1 g. Ni powder (6-8 μ particle size) obtained by decomposing Ni carbonyl was immersed at room temp. in 0.5 ml. of a 5% solution of NaBH₄ in 4N KOH solution. The Ni darkened and increased in volume by 290%. After 22 min., gaseous H started to escape from the solution. The activated powder was placed between 2 fine sieves and inserted in a fuel cell as the neg. electrode. The cell was operated with MeOH dissolved in 6N KOH as fuel and took a load of 10 ma./sq. cm. at room temperature while a sample of unactivated powder similarly tested broke down at a load of 0.08 ma./sq. cm.

IT 7439-89-6, uses and miscellaneous 7440-02-0, uses and miscellaneous 7440-05-3, uses and miscellaneous 7440-22-4, uses and miscellaneous 7440-32-6, uses and miscellaneous 7440-47-3, uses and miscellaneous RL: CAT (Catalyst use); USES (Uses) (catalysts, fuel-cell and hydrogenation)

RN 7439-89-6 HCPLUS

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-32-6 HCPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCPLUS

CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

INCL 136120000
 CC 77 (Electrochemistry)
 ST fuel cells H transfer; nickel catalyst
 H transfer; hydrogenation catalyst;
 hydrogen transfer catalyst
 IT Hydrogenation catalysts
 (metals as, activated by hydrazine anhydride and
 hydroxylamine)
 IT Silver alloys, containing
 (palladium-, catalysts, fuel-cell and hydrogenation)
 IT Palladium alloys, base
 (silver-, catalysts, fuel-cell and hydrogenation)
 IT 7439-89-6, uses and miscellaneous 7440-02-0, uses
 and miscellaneous 7440-05-3, uses and miscellaneous
 7440-22-4, uses and miscellaneous 7440-32-6, uses
 and miscellaneous 7440-47-3, uses and miscellaneous
 7440-48-4, uses and miscellaneous 7440-67-7, uses and
 miscellaneous
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, fuel-cell and hydrogenation)

L379 ANSWER 115 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1968:3603 Document No. 68:3603 Coating permeable membranes
 with electrically conducting metallic films,
 especially the inside of hollow fiber membranes. Levine, Charles
 Arthur; Prevost, Alfred L. (Dow Chemical Co.). U.S. US 3351487
 19671107, 10 pp. (English). CODEN: USXXAM. APPLICATION: US
 19631106.
 AB Permeable membranes are plated with an elec.-conducting
 metallic film by contact of 1 side of
 the membrane with a metal-ion solution and the
 other side with a reducing agent. With cationic
 membranes, the metal ions permeate the membrane
 and are uniformly deposited on the surface in contact with
 the reducing agent. With anionic membranes, the reducing
 agent permeates to cause metal deposition. The membranes,
 which are films or hollow fibers, are uniformly plated
 with reduced waste and are useful in fuel cells.
 Thus, polyethylene hollow fibers (120 μ inside diameter) were
 chlorosulfonated with 10% ClSO₂OH, hydrolyzed, and washed to give an
 ion-exchange capacity of 1.5 meq./g. The ends of a treated
 fiber bundle were potted in epoxy resin and the cast resin was
 machined to expose the open fibers. The encapsulated fiber ends
 were mounted in an apparatus that pumped a reducing solution through the
 side of the fibers, while their exteriors were immersed in a
 plating solution containing 3.5 parts AgNO₃, 3 parts H₂O, and sufficient
 NH₄OH to dissolve initial precipitate. The reducing solution contained PhNHNH
 1, EtOH 11, and H₂O 10 parts. After 1.5 hrs., the fiber interiors
 were plated with an adherent Ag film that did not clog the
 membrane pores and had a resistance of 15 ohms./cm
 . The exterior surface resistance was 5000 ohms
 /cm. Similar conducting membranes were prepared by plating
 Ni, Cu, Pt, Pd, and Au on film or fiber membranes of
 Nafilm I and II, sulfonated nylon (Accropore 5A 6404 Resin), and
 3:7 polyethylene-zeolite mixts. Rochelle salt, a
 NaOH-HaSH·2H₂O-NaH₂PO₂·H₂O mixture, Na₂S₂O₄, a KOH-N₂H₄·H₂SO₄-N₂H₄·H₂O
 mixture, and N₂H₄·H₂O were used as reducing agents.
 IT 7440-05-3, uses and miscellaneous
 RL: USES (Uses)
 (coatings and linings of, on membranes and hollow
 fibers, for fuel cells)

RN 7440-05-3 HCPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

INCL 117227000
 CC 37 (Plastics Fabrication and Uses)
 ST COPPER LINING PLASTIC FIBERS; GOLD LINING PLASTIC FIBERS; FUEL CELL
 FIBER MEMBRANES; NICKEL LINING PLASTIC FIBERS; SILVER LINING
 POLYETHYLENE FIBERS; METAL COATING PERMEABLE
 FIBERS; FIBERS PERMEABLE METAL COATING; PLATINUM
 LINING PLASTIC FIBERS; PERMEABLE FIBERS METAL
 COATING; PALLADIUM LINING PLASTIC FIBERS; POLYETHYLENE
 FIBERS METAL LINING
 IT Membranes
 (fuel-cell, from hollow fibers lined with electrically conducting
 films)
 IT Fiber, synthetic
 RL: USES (Uses)
 (hollow, lined with electrically conducting metallic
 films, for membranes for fuel cells)
 IT Fuel cells
 (membrane for, with hollow fibers, lined with electrically
 conducting films)
 IT Anion exchangers, uses and miscellaneous
 (membranes, and hollow fibers therefrom, coated with
 electrically conducting metallic films, for
 fuel cells)
 IT Lining process
 (of hollow fibers with electrically conducting metallic
 films)
 IT Cation exchangers, uses and miscellaneous
 (sulfonated, membranes from hollow fibers of, lined with
 electrically conducting films, for fuel
 cells)
 IT Nylon, uses and miscellaneous
 RL: USES (Uses)
 (sulfonated, permeable membranes from, coated with
 electrically conducting metallic films, for
 fuel cells)
 IT 7440-02-0, uses and miscellaneous 7440-05-3, uses and
 miscellaneous 7440-06-4, uses and miscellaneous 7440-22-4, uses
 and miscellaneous 7440-50-8, uses and miscellaneous 7440-57-5,
 uses and miscellaneous
 RL: USES (Uses)
 (coatings and linings of, on membranes and hollow
 fibers, for fuel cells)
 IT 9002-88-4, uses and miscellaneous
 RL: USES (Uses)
 (sulfonated, membranes from hollow fibers of, lined with
 electrically conducting films, for fuel cells)

L379 ANSWER 116 OF 116 HCPLUS COPYRIGHT 2005 ACS on STN
 1967:100942 Document No. 66:100942 Inorganic ion-exchange
 membranes fuel cell. Berger, Carl; Strier,
 Murray P. (Douglas Aircraft Co., Inc., Santa Monica, CA, USA). NASA
 (Nat. Aeronaut. Space Admin.) Access., NASA-CR-54784, 177 pp.
 Avail. CFSTI, \$3 hc From: Sci. Tech. Aerospace Rept. 1966, 4(6),
 N66-15227 (English) 1965. CODEN: NAACAF.

AB cf. CA 65, 8326c. The most significant achievement of this program
 was the development of a Zr phosphate membrane impregnated with
 catalyst which can perform in a fuel cell at 0.77-0.78 v. at 30
 ma./cm.2 This type of fuel cell can operate continuously for at
 least 1200 hrs. and has a capability of operating at a temp

. as high as 151°. Extrapolations of enhanced electrocatalytic activity (i.e., higher catalyst loading in the membrane) and lower membrane resistivity down to the 1 ohm -cm. level indicate that a fuel cell performance of 0.840-0.850 v. at 30 ma./cm.2 and 0.820 volts at 50 ma./cm.2 should be possible for the inorg. membrane fuel cell. What is most unusual about the membrane is its high strength and favorable conductivity and stability. The incorporation of the zeolite component is conducive particularly to the latter.

CC 77 (Electrochemistry)

IT Electrodes

(fuel-cell, zirconium phosphate ion-exchanging membranes impregnated with catalyst)

IT Membranes

(ion-exchanging, zirconium phosphate, for fuel cells)

IT Ion exchangers, uses and miscellaneous (membranes, from zirconium phosphate for fuel cells)

IT Fuel cells

(with zirconium phosphate ion-exchanging membranes, impregnating with catalyst)

IT 13765-95-2

RL: PRP (Properties)

(ion-exchange membranes from, for fuel cells)

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